The Journal of the International College of Surgeons

Official monthly publication of the International College of Surgeons

VOLUME 36, NUMBER 2

AUGUST, 1961

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FOUNDED BY DR. MAX THOREK

The Journal of the International College of Surgeons

FOUNDED IN GENEVA, SWITZERLAND, 1935 - INCORPORATED IN WASHINGTON, D. C., 1940

Vol. 36 AUGUST, 1961 No. 2

Abdominal Surgery

A Simplified Perfusion Pump for Laboratory Use

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THE CLINICAL use of a mechanical heart-lung apparatus has extended beyond the original purpose, which was to support the total body circulation extracorporeally in order to permit direct open heart surgery.[1] The machines are now used to support the circulation in a variety of cardiovascular disorders, such as the shock of coronary thrombosis and heart failure.[2] Recently, they have been used during the perfusion of various isolated regions of the body with anti-cancer drugs in large doses which, if given by ordinary means, would be extremely toxic if not fatal to the patient.[3] Attempts are currently being made to isolate various organs that are frequently involved by cancer for the purpose of perfusing them with chemotherapeutic agents.[4]

From the M.D. Anderson Hospital and Tumor Institute, University of Texas, Houston.

Aided in part by an Institutional Grant from the American Cancer Society.

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Submitted for publication April 24, 1961.

An inexpensive pneumatic perfusion pump is described, which functions on the basis of pressure differentials in its three chambers and exerts no direct pumping action on the inflow and outflow lines. Direct readings of the flow rate can be made from a calibrated flowmeter chamber. This pump is well suited for laboratory testing or for teaching studies on extracorporeal circulation, particularly of perfusion in isolated regions or organs.

This ever increasing utilization of heart-lung machines in clinical medicine brings a new need into medical education; that is, to see that students possess a knowledge of the mechanics and particularly of the physiology of extracorporeal circulation.

Unfortunately, the high cost of the pumping mechanisms now in use precludes the purchase of a sufficient number of these apparatuses to be used in a medical school physiology laboratory. It is obvious, therefore, that little if any practical instructions in regard to extracorporeal circulation can be offered on the student level. There is a great need for an economical, yet efficient apparatus for laboratory use. It was with this in mind that the present investigations were initiated.

Design.—The pump mechanism is unique in that there is no direct pumping action on either the inflow or the outflow tubing. The pump is regulated entirely by negative air pressure and positive oxygen pressure (to be described). The pumping area consists of three plastic chambers machined from Lucite (Figs. 1 and 2).

Receiving Chamber (Fig. 2*A*): This chamber measures 2 by 2 inches (5 by 5 cm.). It receives the blood from the oxygenator through an orifice above. For our purposes, we use a DeWall type of oxygenator composed of a 75 cm. length of Tygon tubing with an inside diameter of 1 inch (2.5 cm.). At the proximal end of the tubing an adapter receives the venous and oxygen inflow tubing. The distal portion of the tubing serves as the defoaming area. A piece of stainless steel scouring pad sprayed with Dow-Corning Antifoam A is inserted into this area (Fig. 3).

The oxygenated blood entering the upper orifice of the receiving chamber then flows to the bottom of the chamber via a small helix. Extending from the lower opening of the chamber is a column 6 inches (15 cm.) in length and ⅜ inch in diameter. At the lower end of this column is a Formica valve of the floating type (Fig. 2, insert). Entering the lateral wall in the upper portion of the chamber

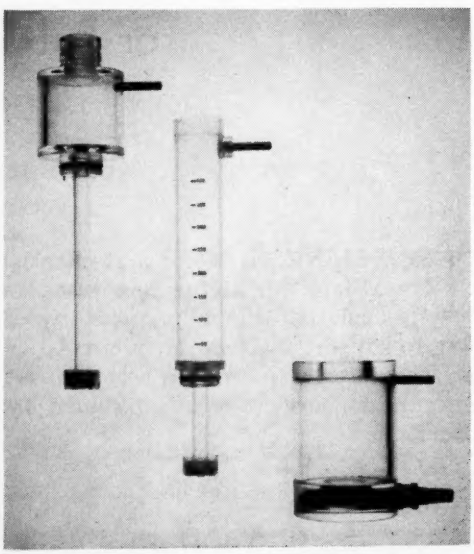

Fig. 1.—Photograph of three chambers of perfusion pump disassembled. *Left*, receiving chamber; *center*, flowmeter; *right*, reservoir.

is a metal connector, to which is attached a tube extending from a vacuum source.

Flowmeter (Fig. 2*B*) : This chamber is 6½ inches (16.5 cm.) long and 1¼ inches (3.1 cm.) in diameter and is calibrated from 0 to 400 cc. per minute. The upper opening of the chamber fits onto the lower portion of the receiving chamber over an O ring, and the column of the latter chamber extends down into the cavity of the flowmeter. From the lower orifice extends a column similar to that described on the receiving chamber but only 2¼ inches (5.6 cm.) in length. This also contains at its lower end a floating Formica valve. At the upper end of the chamber a connector enters the wall for the attachment of a tubing from a solenoid valve.

Reservoir (Fig. 2*C*) : This final chamber is 3 inches (7.5 cm.) long and 2½ inches (6.2 cm.) in diameter. Its upper orifice fits on to the flowmeter over an O ring, the lower column of the flowmeter extending into the reservoir. From its lower end an orifice containing a filter opens into an outflow adapter. This adapter is fitted on over O rings. A connector for attachment of an oxygen tube enters the upper portion of the chamber.

Electrical Circuit: The apparatus operates from a 115 volt AC circuit. The electrical elements are housed in a Plexiglas box and consist of a timing motor and a solenoid valve. A 4 rpm synchronous motor is utilized with a cam attachment which activates a microswitch at intervals of fifteen seconds, controlling the three-way solenoid valve.

Operation.—The pump functions on the basis of the pressure differentials in the three chambers, which in turn regulate the opening and closing of the valves. The receiving chamber is constantly under negative pressure from a vacuum source (Fig. 3*A*), whereas the reservoir is constantly under positive oxygen pressure (Fig. 3*B*). The intermediate chamber, the

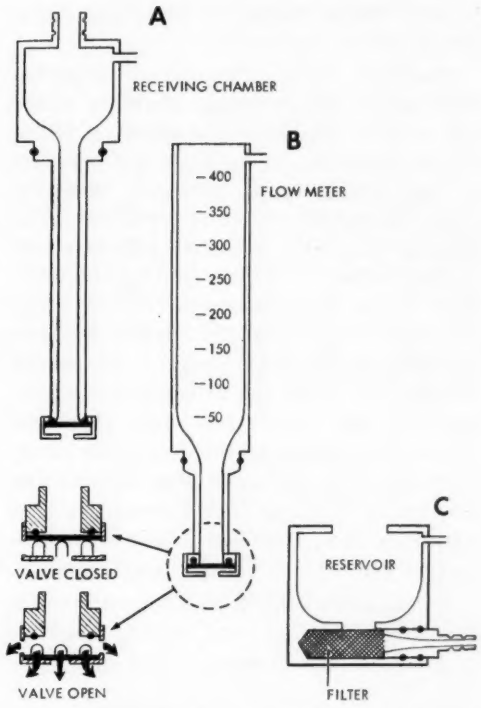

Fig. 2.—Diagram of pump chambers. Insert shows floating valve in open and closed positions.

flowmeter, alternates at fifteen-second intervals between negative and positive pressure, depending upon the action of the line from the solenoid valve (Fig. 3*C*). Only 250 cc. of whole blood is required to prime the apparatus.

Venous Inflow: The venous blood collected either from the vein directly or by gravity drainage is raised to the oxygenator by the negative air pressure and bubbled to the defoaming area by the oxygen entering the venous inflow adapter. The oxygen flow is maintained at a constant level controlled by an oxygen flowmeter. The negative pressure is adjusted by a regulator on the instrument panel and is usually initiated at a pressure of 60 mm. of mercury. Increased or decreased inflow into the receiving chamber

is controlled by manipulation of this negative pressure regulator.

Chamber Flow: The initial negative pressure in the receiving chamber closes the valve at its lower end allowing filling of the chamber. At the start the pressure in the flowmeter is positive; however, when the solenoid valve is energized (Fig. 3*D*), it opens the negative pressure line to the flowmeter. This equalizes the pressure in the two chambers, thereby opening valve No. 1 from the receiving chamber and allowing blood from this upper chamber to enter the intermediate chamber. At the same time, this increased negative pressure in the flowmeter closes valve No. 2 at its lower end. It is during this phase of filling of the flowmeter that the exact flow, determined in cubic centimeters per minute, can be ascertained.

At the end of the fifteen-second interval the solenoid valve cuts off the negative pressure to the flowmeter and opens the positive pressure line (Fig. 3*E*). The increased positive pressure in the flowmeter closes the receiving chamber valve (No. 1). With equalization of pressure in the flowmeter and reservoir, the flowmeter valve (No. 2) opens, allowing filling of the lower chamber.

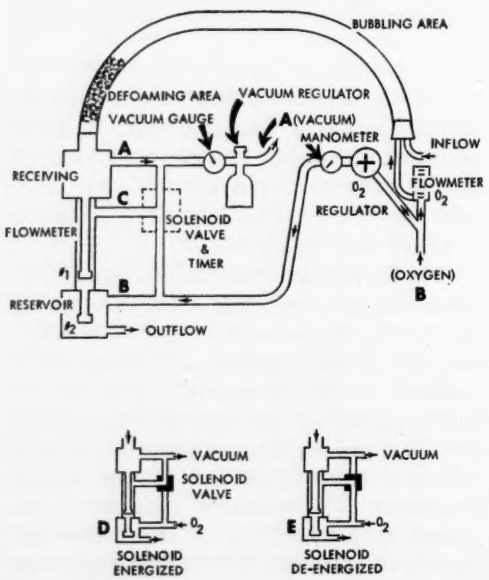

Fig. 3.—Diagram of pump operation and action of solenoid valve (see text).

Arterial Outflow: The reservior is always under positive oxygen pressure (Fig. 3*B*) and results in a constant outflow. The pressure in this chamber is regulated by a control on the oxygen source and is initially set at a pressure of 40 mm. of mercury. Increase or decrease in this oxygen line pressure will proportionately increase or decrease the outflow from the reservoir.

The pump described above is capable of delivering an output of 400 cc. per minute. By simply modifying the size of the chambers, flow rates up to 4,000 cc. per minute can be obtained.

Results.—This pump has been used in a total of 103 operations in which isolation and perfusion of the intact canine liver have been performed. A survival figure cannot be given for this group of animals, because of the nature of the experiments. Most of them were done to test the tolerance of hepatic tissue to various doses of known hepatotoxic drugs.[5] Hepatic necrosis, therefore, accounted for the death of many of these dogs. In none, however, could death be attributed to a pump failure. The pump has thus far been used in 1 clinical case, during a perfusion of the head and neck, with no complications.

Figure 4 illustrates the changes in certain of the blood elements and P_h values in the perfusion circuit in 6 experiments. In these testings we used the low-flow pump aforedescribed, with a constant blood volume of 250 cc. and a flow rate of 300 cc. per minute. Perfusions were carried out for one hour. It is particularly interesting to note that the mean rise

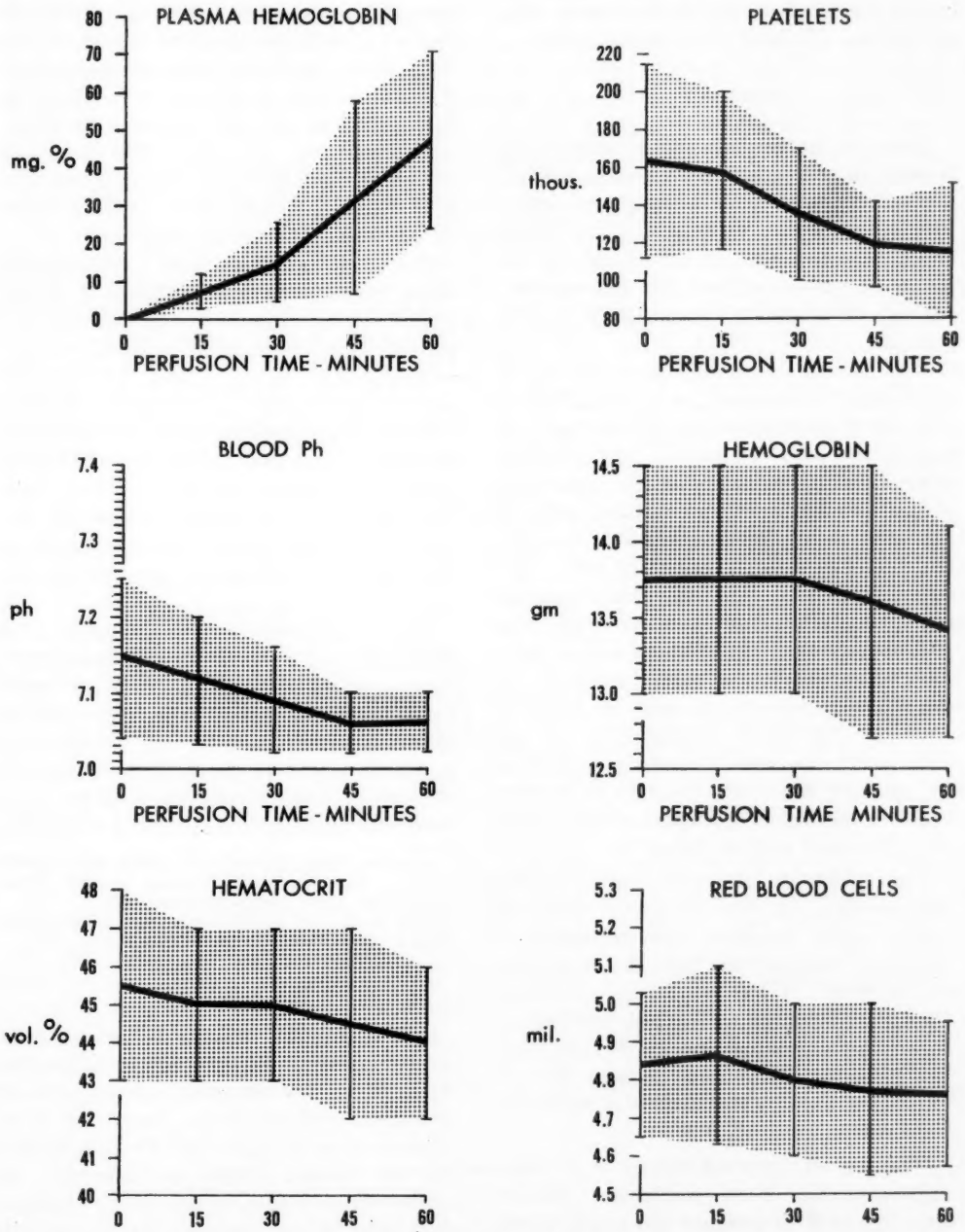

Fig. 4.—Range *(stippled area)* and mean values *(solid line)* of various blood studies performed during one-hour perfusion in 6 experiments. Pump blood volume in each experiment was 250 cc., and flow rate 300 cc. per minute.

in the plasma hemoglobin level was only 45 mg. per hundred cubic centimeters.

COMMENT

Many controversial points exist with regard to extracorporeal pump mechanisms.[6] One thing is certain, however; they are all rather expensive. This, in our opinion, is one distinct advantage of the pump we have described, for this apparatus can be fabricated at a relatively low cost.

Economy of construction, however, is secondary to efficiency in a pump whose purpose is to support, either partially or totally, the body circulation extracorporeally. An efficient pump is one that will propel the blood at the desired rate of flow and in so doing produce a minimal amount of trauma to the blood cells. The two most popular pumps available are the roller-type (DeBakey) and the finger-type (Sigmamotor). Both of these pumps produce either partial or total occlusion of the venous and arterial lines in order to circulate the blood through the tubing. The pump we have described, operating by pressure differentials in its chambers, requires no direct pumping action upon the inflow and outflow tubes.

The outflow is therefore constant and nonpulsatile. It was formerly assumed that a pulse pressure was necessary to maintain normal function of the organs of the body.[7] It has since been concluded that a nonpulsatile flow is not detrimental in an extracorporeal circuit but may actually be an advantage, because the jet effect produced by the outflow is much less than with a pulsatile flow.[8]

The use of internal valves in a pump apparatus has been challenged because they are said to produce too much turbulence and, therefore, hemolysis, and that they also make the cleaning of the apparatus difficult.[8] The results of the plasma hemoglobin determinations, as shown in Figure 4, indicate that the action of the two valves produces minimal hemolysis. The valves are sterilized by soaking in Zephiran, and cleaning is not a problem, since they are disposable. The pump is extremely easy to assemble and dismantle. It is disassembled in such a manner that all parts may be easily sterilized.

Operation is simple, only three controls being present on the instrument panel. The oxygen flowmeter control to the oxygenator is set initially at a predetermined setting and is rarely, if ever, altered during the perfusion. The surgeon concerns himself, therefore, only with the negative pressure gauge and the gauge controlling positive pressure on the outflow line. Once perfusion is established at the desired flow rate, further manipulations of the pressure regulators are rarely required.

The incorporation of a flowmeter in a perfusion pump is of the utmost importance, particularly when one is perfusing an isolated organ. It permits rapid recognition of alterations in the flow rate and a constant indication of flow during the perfusion. Our flowmeter chamber performs this duty both simply and efficiently.

Authors' Note: We wish to thank Mrs. Estelle Puckett, Mrs. Christene Dinning and Mr. Peter Taylor for their technical assistance.

This pump can be obtained from Sigmamotor, Inc., 3 North Main St., Middleport, New York.

RÉSUMÉ

L'auteur décrit une pompe pneumatique à perfusion simplifiée et d'un faible prix de revient, fonctionnant sur la base de pressions différencielles dans ses trois chambres, et n'ayant pas d'action directe sur les niveaux d'influx et de reflux. La lecture directe de la vitesse d'écoulement se fait grâce à une chambre d'indicateur de débit calibrée. Cette pompe se prête aux examens de laboratoire, aux expériences ou à l'enseignement sur les études ayant

trait à la circulation extracorporéale, et spécialement à la perfusion dans des régions ou organes isolés.

RIASSUNTO

Viene descritta una pompa pneumatica da perfusione, economica, che funziona per un meccanismo di pressione differenziale nelle sue tre cavita' e non ha un'azione diretta sul flusso. Si possono avere per lettura diretta i dati sul flusso mediante un flussometro calibrato. Questa pompa e' molto utile per scopi sperimentali sia di studio che di insegnamento sulla circolazione extracorporea, e specialmente per la perfusione di organi o regioni isolate.

RESUMEN

Se describe una bomba neumática de perfusión simple y barata que funciona sobre la base de presiones diferenciales en sus tres cámaras y no tiene acción directa de bombéo sobre las linéas de entrada y salida. Se pueden hacer lecturas directas del débito en una cámara calibrada para ello. Esta bomba es muy apropiada pra aser usada en el laboratorio especialmente en los estudios de circulación extracorpórea y en la perfusión de órganos o de regiones aislados.

ZUSAMMENFASSUNG

Es wird eine billige vereinfachte pneumatische Durchströmungspumpe beschrieben, die auf der Basis von Druckunterschieden in ihren drei Kammern funktioniert und auf die Einström- und Ausströmlinien keine direkte Pumpwirkung ausübt. Eine kalibrierte Strommesskammer gestattet direkte Ablesung der Stromgeschwindigkeit. Die Pumpe eignet sich gut für Laboratoriumsuntersuchungen oder für den Unterricht von Kreislaufuntersuchungen ausserhalb des Körpers, besonders bei der Durchströmung isolierter Körpergegenden oder Organe.

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Experience with Cholecystectomy and Choledochostomy in Three Hundred Cases*

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ALTHOUGH cholecystectomy is the second most common operation performed upon the gastrointestinal tract,[1] there is little agreement among surgeons or between surgeons and internists with regard to the indications for cholecystectomy, the management of asymptomatic gallstones, indications for exploration of the common bile duct, the management of acute cholecystitis or the use of operative cholangiographic studies. Experience dictates concepts and procedures, so that eventually, by correlation of data gained by experience, agreement comes closer. This paper summarizes our experience with 300 patients who underwent operation for diseases of the gallbladder and/or the bile ducts at Tripler U. S. Army Hospital between January 1, 1957, and June 30, 1960.

Case Material.—Of our 300 patients, 210 were female and 90 were male, a ratio of 2.3:1. The average age of the female patients was 33.6 years; that of the male patients, 43.8 years. These patients were younger than those of the usual university series, because many of them were on active duty in the Armed Forces. Thus, 77 per cent of the female and 55 per cent of the male patients were under 40 years of age. The duration of symptoms varied; there were some patients with no symptoms who were undergoing operation for silent gallstones, and others with known disease of more than twenty years' duration. The average duration of symptoms was three and one-tenth years.

In our opinion, if the general status of the patient permits, cholecystectomy for silent gallstones is entirely justified as soon as possible after the diagnosis is

*This material has been reviewed by the Office of The Surgeon General, Department of the Army, and there is no objection to its presentation and/or publication. This review does not imply any indorsement of the opinions advanced or any recommendation of such products as may be named.

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Submitted for publication Feb. 21, 1961.

The authors report a study of 300 patients at Tripler U.S. Army Hospital, Honolulu, operated on for diseases of the gallbladder, diseases of the bile ducts, or both, between January 15, 1957, and June 30, 1960. The problem of acute cholecystitis is analyzed and the indications and contraindications for cholecystectomy pointed out.

established. We base this on the fact that complications will develop in 40 per cent of patients with gallstones and symptoms will appear in 50 per cent within five years after the diagnosis.[2] Furthermore, 70 to 80 per cent of patients with carcinoma of the gallbladder have associated gallstones and there is a 4 to 5 per cent risk that carcinoma will develop in patients with gallstones.[2] The mortality rate for elective cholecystectomy is reported as less than 1 per cent in uncomplicated cases,[3] and we encountered no deaths in our 300 cases. Indeed, in the service of one of us (W.F.B.) no patient has died of disease of the gallbladder since 1938 and in no case has the common duct been injured. When these results are compared with the risk of serious complications and the increasing mortality rate that accompanies advancing age, "prophylactic" cholecystectomy for silent gallstones is definitely indicated.[4]

Oral Graham-Cole cholecystographic examination is a highly efficient diagnostic method and when repeated and/or reinforced is sufficiently sensitive. Several false positive results have been obtained with the intravenous cholografin test. We rarely operate without positive roentgen visualization of stones unless repeated and reinforced tests reveal no filling. In our series, oral cholecystograms were taken of 293 patients. Of the remaining 7, 3 were being operated on after previous cholecystectomy and 4 had gallstones discovered by palpation during operation for other conditions, without previous roentgen studies. In 195, or 66.5 per cent, of the cases in which oral cholecystograms had been taken, gallstones were visible on the films. In 99 per cent of cases this was confirmed at operation. In the 2 cases in which there was a "false positive" result, 1 of the patients had papilloma of the gallbladder, and the other had gross and microscopic chronic cholecystitis, possibly because they had passed the stone. Abnormalities other than stones were revealed by roentgen examination in 2 other patients, 1 of whom had congenital adhesive bands from the duodenal surface, constricting the neck of the gallbladder, and the other had a papilloma.

When the gallbladder does not fill on repeated and reinforced examinations, we consider obstruction of the cystic duct by stone a justifiable diagnosis. Ninety-six, or 32.7 per cent, of our patients showed nonfilling on reinforcement. and in 98 per cent of these a stone obstructing the cystic duct was found at operation. In 2 instances, although there were no stones, severe gross and microscopic chronic cholecystitis was observed.

Intravenous cholangiographic study and the opacification of gallstones and other diagnostic tests are not necessary.[5] In the absence of hepatic disease, nonvisualization of the gallbladder means obstruction of the cystic duct in more than 98 per cent of cases.[6] The use of additional tests constitutes an additional risk and expense to the patient and is unnecessary.

Exploration of the common duct is reported to increase the fatality rate, but this has not been our experience. We perform choledochostomy only for cause, including palpable stone, a dilated or thickened duct, jaundice or a history of recent jaundice, small stones in a patient with a cystic duct large enough for them to pass, or turbid bile returning from the stump of the cystic duct. We have never used operative cholangiographic study and do not need it. Twenty-seven (9 per cent) of our patients underwent exploration of the common bile duct. Excluding three patients who had previously undergone cholecystectomy, 24 (8 per cent) were choledochostomized at the time of the initial operation. All 3 patients who had undergone previous operations had choledocholithiasis. Fourteen (58 per cent) of the

remaining 24 had stones in the common bile duct.

Hight and his co-workers stated that the surgical error for "missed" stones in the common bile duct is 12 per cent, while the cholangiographic error is 7.4 per cent.[7] One hundred and forty-eight (19 per cent) of their patients underwent choledochostomy, and stones were present in 59 per cent. One hundred and five (70 per cent) had the usual indications for exploration of the common bile duct, which probably would have been done regardless of the cholangiographic data, as is implied in their discussion of 7 per cent false negative results. There was a 5 per cent false positive error, so that the total cholangiographic error was 12 per cent if one includes both false negative and false positive errors. Bartlett and Dreyfuss recorded a 4.2 per cent incidence of residual stones in the common duct and expressed the opinion that operative cholangiographic investigation would not improve this figure.[8]

In our series, 1 common duct stone was missed (4 per cent incidence) and in this case the common bile duct had been explored. It has been said that more residual stones are discovered in previously choledochostomized patients than in patients who have undergone cholecystectomy alone. The aforementioned stone was so small that it passed with irrigation of the common bile duct through the T tube. One patient (4 per cent) was known to have residual stones in the left hepatic duct because of the surgeon's inability to remove them at operation. She was followed for eighteen months after the operation, and there was no recurrence of symptoms. In only 1 of our 300 cases would operative cholangiographic investigation have been useful, and even in that case the stone passed with simple irrigation. Our 4 per cent incidence of "missed" stones and 4 per cent incidence of known retention of stones is comparable to those recorded in series in which routine operative cholangiographic study is employed.[9] In neither instance was the omission of any significance.

The management of acute cholecystitis continues to be a controversial subject. The literature is difficult to assess, because, obviously, many authors are calling acute gallstone colic acute cholecystitis. To us, acute cholecystitis is a mechanical-chemical problem characterized by obstruction of the cystic duct, usually by stone and usually with pancreatic enzymes identifiable in the cholecystic bile. Gangrene due to mechanical tension is frequent, bacterial invasion is rare and perforation is unusual.[10] Fever and leukocytosis are present, and the gallbladder is frequently palpable.

Heuer cited a 15.7 per cent incidence of perforation with 12.5 per cent mortality. An 11 per cent incidence of perforation and a 6 per cent incidence of gangrene were noted by Jones and others,[11] while Ravdin reported a 5 per cent incidence of perforation. There are two basic approaches to the treatment of acute cholecystitis:

1. Early operation is necessary in some cases because of the risk of perforation and bile peritonitis.

2. Conservative management with later elective interval cholecystectomy is better because there is little or no mortality and bile peritonitis is not a significant problem even if perforation occurs.

Twenty-five (8.3 per cent) of our patients had acute cholecystitis. Conservative management, consisting of nasogastric intubation and administration of intravenous fluids, antispasmodics and antibiotics if necessary, followed by elective cholecystectomy at a later date, was employed in 24 cases, without a death. In 1 case (4 per cent) perforation was proved at operation. The patient was orig-

inally operated on for a right subhepatic abscess, and the diagnosis of acute cholecystitis was made at that time. Although he never had jaundice, a spontaneous choledochoduodenal fistula was observed subsequently at cholecystectomy. In 1 patient an esophageal ulcer developed, secondary to nasogastric intubation. The ulcer bled, and 2,000 cc. of blood and a Blakemore tube were required for control. This was the only other major complication in the group treated conservatively. All patients underwent elective cholecystectomy within one week to six months after their acute illness, with an average interval of six weeks. Adhesions were not troublesome. Surgical residents performed most of the operations. Pneumonitis developed in 1 patient and a wound infection in another. There were no other complications. Four patients (16.6 per cent) underwent choledochostomy; stones were present in 2 (50 per cent).

Only 1 of our patients, early in the series, underwent cholecystectomy during the acute phase of cholecystitis. He was a difficult patient, had failed clinic appointments, came in acutely ill and was operated on ill-advisedly as an "emergency." A subhepatic abscess, a duodenal fistula, wound infection and thrombophlebitis developed. The patient recovered after a complicated course. According to our experience, neither cholecystectomy nor cholecystostomy is necessary during the acute phase of cholecystitis.

It is true that our patients ranged in age from 20 to 68, with an average age of 42, which is much younger than that cited in other series, in which the disease occurred usually in the sixth or seventh decade of life or later,[12] and this undoubtedly influences our results. Regardless of age, our results have been good even in cases of perforation in a small series. This experience, however, has been constant.

Of our 300 patients, 28 (9 per cent) had postoperative complications. Of these 28, 10 (35.7 per cent) had atelectasis and/or pneumonitis that responded to mechanical measures and antibiotics. This did not prolong hospitalization in most cases. In 10 patients (35.7 per cent), wound complications occurred: a hematoma, four infections of the main wound and five infections of the site of drainage. All responded to incision and drainage and to irrigations or saline soaks. Antibiotics were not used. Two patients (7 per cent) had cystitis secondary to postoperative retention of urine and catheterization of the bladder. There was 1 case (3.5 per cent) of thrombophlebitis of the arm secondary to intravenous infusion; this was treated with warm compresses. Postoperative hemorrhage necessitating abdominal reexploration and ligation of a bleeding vessel in the gallbladder fossa occurred in 1 case. Evisceration in 1 case necessitated resuturing, and in 1 patient there developed an incisional hernia, which was repaired without difficulty later. In 1 case jaundice developed in the immediate postoperative period, owing to angulation of the common duct by a T tube.

SUMMARY AND CONCLUSIONS

1. Gallstones should be removed by cholecystectomy whenever diagnosed, unless serious contraindications exist.

2. In our 300 cases, 77 per cent of the female patients were under 40 years of age and 13 per cent under 25.

3. Cholecystectomy and choledochostomy have not been attended by death in our practice, and the incidence of postoperative complications has been 9 per cent.

4. In our experience, nonfilling of the gallbladder after repeated and reinforced roentgen examination means, in 98 per cent of instances, that a stone is impacted in the cystic duct.

5. The common duct is explored in 9 per cent of patients, and stones are detected in 63 per cent of these. Operative cholangiographic procedures are not used and are not needed. We have missed 1 common duct stone, but this was so small that it passed by T tube irrigation.

6. For acute cholecystitis, conservative treatment is employed, followed by elective cholecystectomy in the interval. In our practice, even perforation is not an indication for operation. There has been no mortality in this series or in the previous experience of one of us (W.F.B.).

RIASSUNTO E CONCLUSIONI

1. I calcoli della colecisti debbono essere asportati mediante la colecistectomia non appena diagnosticati, a meno che non vi siano delle serie controindicazioni.

2. Nei nostri 300 casi il 77% delle femmine erano al di sotto dei 40 anni di eta' e il 13% al di sotto dei 25.

3. Ne' le colecistectomie ne' le coledocotomie furono gravate da mortalita' operatoria nella nostra casistica, e le complicanze post-operatorie furono il 9%.

4. Nella nostra esperienza il mancato riempimento della colecisti dopo ripetuti esami radiografici significo, nel 98% dei casi, la presenza di un calcolo incuneato nel cistico.

5. Noi abbiamo esplorato la via biliare principale nel 9% dei casi, e abbiamo trovato calcoli nel 63%. Non facciamo colangiografie perche' non le riteniamo necessarie. Ci e' sfuggito un solo calcolo nel coledoco, ma era cosi' piccolo che fu poi eliminato attraverso il tubo a T.

6. Nella colecistite acuta facciamo la cura conservatrice e la colecistectomia in seguito; nella nostra pratica neppure la perforazione ha rappresentato una indicazione all'intervento. Non abbiamo avuto alcun morto fra questi malati, ne' in un gruppo precedente.

RESUMEN Y CONCLUSIONES

1. Los cálculos biliares deben ser extirpados quirurgicamnete una vez diagnosticados salvo que haya una contraindicación grave.

2. En nuestros 300 casos, 77 por ciento de las enfermas tenían menos de 40 años y 13 menos de venticinco.

3. Colecistectomía y coledocostomía nunca han sido seguidas de muerte en nuestra estadística y solo en un 9% de los casos hubo complicaciones postoperatorias.

4. De acuerdo con la experiencia del autor la falta de visualizuación de la vesícula en colecistografías repetidas indica el impacto de un cálculo en el cístico en el 98% de los casos.

5. El autor ha explorado el colédoco en un 9% de los casos encontrando cálculo en un 63% de las veces. El autor no usa ni cree necesaria la colangiografía operatoria. En un caso al autor se le escapó de locaclizar un pequeño cálculo del colédoco pero dado su pequeno tamaño salió facilmente por el tubo de T.

6. En las colecistitis agudas se usa tratamiento conservador esperando para operar en la fase de reposo. Para el autor no tan siquiera la perforación constituye una indicación operatoria. No ha habido mortalidad en las series operadas por los autores.

RÉSUMÉ ET CONCLUSIONS

1. Les calculs biliaires devraient être extraits par une cholécystectomie chaque fois qu'ils sont diagnostiqués, sauf en cas de contreindications sérieuses.

2. Dans les 300 cas des auteurs, 77% des femmes atteintes étaient âgées de moins de 40 ans, et 13% de moins de 25 ans.

3. Les auteurs n'ont pas eu de décès à la suite de cholécystectomies ou de cholédochostomies; le taux des complications n'a pas dépassé 9%.

4. Selon leur expérience, le défaut de remplissage de la vésicule biliaire après des examens radiologiques répétés et approfondis signifie dans 98% des cas qu'un calcul est logé dans le canal cystique.

5. Les auteurs ont exploré le cholédoque dans 9% des cas et ont trouvé des calculs dans 63% de ces cas. Ills ne recourent pas aux techniques de cholangiographie, qui ne sont pas nécessaires. Un calcul du cholédoque leur a échappé, mais il était si petit qu'il a été éliminé par une irrigation avec un tube en T.

6. Pour la cholécystite aiguë, les auteurs recourent au traitement conservateur. Selon leur expérience, la perforation même n'est pas une indication opératoire. Il n'y a eu aucune mortalité dans cette série de cas ni dans celle décrite antérieurement par l'un des auteurs.

ZUSAMMENFASSUNG UND SCHLUSSFOLGERUNGEN

1. Gallensteine sollten, wenn immer die Diagnose gestellt ist, durch Resektion der Gallenblase entfernt werden, es sei denn dass ernste Gegenindikationen bestehen.

2. Unter den 300 Fällen der Verfasser waren 77 Prozent der weiblichen Patienten jünger als 40 Jahre und 13 Prozent jünger als 25 Jahre.

3. In der Praxis der Verfasser kam es zu keinem Todesfall als Folge von Gallenblasenresektion oder Choledochostomie, und das Vorkommen postoperativer Komplikationen betrug 9 Prozent.

4. Nach Erfahrung der Verfasser beruht das Versagen der röntgenologischen Darstellung der Gallenblase bei wiederholten Untersuchungen in 98 Prozent der Fälle auf einem im Gallenblasengang eingeklemmten Stein.

5. In 9 Prozent der Fälle wurde der Choledochus exploriert; in 63 Prozent von diesen wurden Steine gefunden. Röntgenologische Untersuchung der Gallengänge während der Operation werden nicht angewandt und als unnötig gefunden. Den Verfassern ist nur ein Stein im Choledochus entgangen, und dieser war so klein, dass er durch Spülung durch ein T-Rohr ausgetrieben wurde.

6. Akute Gallenblasenentzündung wird konservativ behandelt und die Gallenblasenresektion im Intervall vorgenommen. In der Praxis der Verfasser stellt auch eine Perforation keine Indikation zum chirurgischen Eingriff dar. Weder in der hier dargestellten Krankenserie noch in früheren Beobachtungen eines der Verfasser (Bowers) kam es zu einem Todesfall.

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Instances of major persecution still mar the pages in which medical history is being written in our twentieth century. Let us hope that, in the freer interchange of ideas which we boast about today, injustices are more quickly righted. Such injustices, however brief, impede the forward march of any profession. And the wheels of progress are slowed also, slowed perhaps in the long run even more, by the pettier persecutions born of professional jealousy which so often prevent able and earnest men from making to the science and practice of medicine the contribution which they might make. Let any medical man climb by merit a little above his erstwhile fellows and the pack is on him in full cry. He is at once set upon both by the many below him who wish to pull him back to their level and by some above him who fear that his upward progress menaces their cherished prestige. We use modern methods, of course. We do not resort to the Inquisition. We do not even, as a rule, find it necessary to pillory the offender in long and learned published refutations of his ideas and work. We use subtler methods. It is so easy. Just an insinuation, a shrewd phrase uttered at the right time and in the right place, an artful smile and a shrug of the shoulders. That's all we need often to blast completely and well-nigh irrevocably an innocent colleague's reputation. And every time the thing happens, the great profession which we serve is weakened and smirched.

—*Max Thorek*

Ligation of the Internal Iliac (Hypogastric) Arteries: A Life-Saving Procedure for Uncontrollable Gynecologic and Obstetric Hemorrhage

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The authors would remind all obstetricians, gynecologists and others who perform pelvic operations that serious hemorrhage is still a major cause of death. They recommend ligation of the hypogastric arteries, which in their hands has often proved life-saving. Nine representative cases are reported.

AT THE Cook County Hospital and in private practice, pathologic conditions and situations arise in gynecologic and obstetric practice which cause and create a serious life-threatening hemorrhage. This hemorrhage is often difficult or impossible to control by the conventional methods of packing or suturing, or both. It is in such situations that multiple transfusions, plasma and the aforementioned attempts fail, and a *definitive step* must be taken before the hemorrhage results in death. Hemorrhage today still ranks high as a cause of maternal mortality in the United States. It is in these desperate situations that ligation of the hypogastric vessels will often save a life. This report deals with our own experiences, on the basis of 82 cases, including definitive and prophylactic ligations; also, Wertheim hysterectomies and carcinoma of the cervix.

We are convinced that the men in the field and the residents must think in terms of surgical anatomy, and particularly of the surgical anatomic character of the vessels involved. When we discussed the problem of ligating the hypogastric vessels with many of our colleagues, both

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Submitted for publication March 27, 1961.

in general surgery and in gynecology and obstetrics, as well as those who on occasion may be called upon in an emergency, it was surprising to find that not too many have done these, and that many are entirely devoid of any knowledge of this type of life-saving procedure. A review of autopsy case reports of deaths due to obstetric and gynecologic hemorrhage has convinced us that, had this ligation been used, some lives might have been saved. In our personal practice, in which we have ligated the hypogastric vessels unilaterally or bilaterally, we have *not seen a single instance* of any ill effects upon the pelvic viscera, including the bladder and the bowel.

Consultation with those of our colleagues who have done these ligations revealed that they too have seen no ill effects from such ligations. Our excellent friends in general surgery, who do routine ligations of the hypogastric vessels in abdominal perineal resection for carcinomas of the lower part of the gastrointestinal tract (a probable aggregate of several hundred cases), have not encountered one bad result from such ligations on the pelvic anatomic structures.

Surgical Anatomic Considerations.—The internal iliac (hypogastric) artery arises from the bifurcation of the common iliac artery opposite the upper part of the sacroiliac joint, at the level of the lumbosacral disc. It is about 1½ inches (3.7 cm.) in length. It descends into the true pelvis, dividing into a posterior and anterior division to supply the viscera, muscles and fascia of the pelvis and the gluteal, perineal and anorectal regions.

The important relations of the internal iliac artery are as follows:

1. Anteromedial—covered by peritoneum. (The internal iliac is retroperitoneal.)
2. Anterior: the ureter (retroperitoneal and attached to the peritoneum).
3. Posterolateral: the external iliac vein and obturator nerve.
4. Posteromedial: the internal iliac vein.
5. Lateral: the major and minor psoas muscles.

Branches of the internal iliac artery are shown in the accompanying table.

Branches of the Internal Iliac Artery

Posterior Division	*Anterior Division*		
Parietal	Parietal	Visceral	
Iliolumbar	Obturator	Umbilical	Uterine
Lateral sacral	Internal pudendal	Superior vesical	Vaginal
Superior gluteal	Inferior gluteal	Middle hemorrhoidal	

Collateral Circulation.—Blood supply to the pelvic structures after unilateral ligation of the internal iliac artery is carried on by anastomosis of the following vessels: (1) The uterine and ovarian arteries. (2) The vesical arteries of the two sides. (3) The hemorrhoidal branches of the internal iliac arteries with those from the inferior mesenteric artery. (4) The obturator artery, by means of its pubic branch, with the vessels of the opposite side. (5) The inferior epigastric artery and the medial femoral circumflex artery. (6) The circumflex and perforating branches of the profunda femoris artery with the inferior gluteal artery. (7) The superior gluteal artery with posterior branches of the lateral sacral arteries. (8) The iliolumbar artery with the last lumbar artery. (9) The lateral sacral artery with the middle sacral artery. (10) The iliac circumflex artery with the iliolumbar and superior gluteal artery.

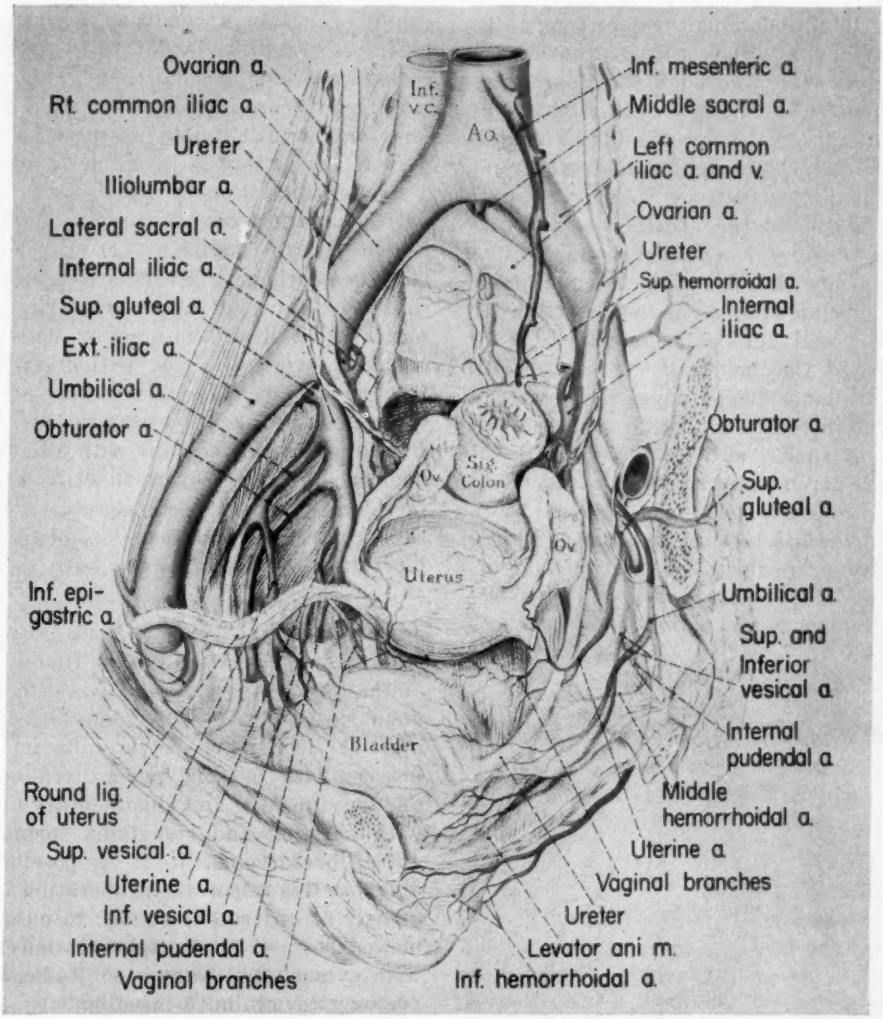

Fig. 1.—Gross anatomic picture. Note common iliac artery, external iliac artery and the internal iliac (hypogastric) artery and its branches; also ureter at bifurcation.

Circulation to the pelvic structures after bilateral ligation of the internal iliac artery is effected through the following channels: (1) Both ovarian arteries (from the aorta). (2) Branches of the inferior epigastric artery (from the external iliac) of both sides. (3) Superior hemorrhoidal artery (from the inferior mesenteric artery). (4) Circumflex and perforating branches of the deep femoral arteries of both sides. (5) Lower lumbar arteries of both sides (from the aorta).

Indications for Ligation of the Internal Iliac Arteries when Conventional Methods Have Failed.—Definitive: (1) Uncontrollable bleeding from the vaginal vault fol-

lowing total abdominal hysterectomy. (2) Uncontrollable bleeding from the vaginal vault following vaginal hystrectomy. (3) Wertheim hysterectomy. (4) Uncontrollable bleeding in the angles of the vagina and lower cardinal ligaments during total abdominal hysterectomy. *Desperate deep bites to control the bleeding may incorporate the ureter.* (5) Carcinoma of the cervix with uncontrollable hemorrhage. Both ovarian arteries in the outer border of the broad ligament should also be ligated. (6) Carcinoma of the vagina with uncontrollable hemorrhage. Both ovarian arteries in the outer border of the broad ligament should also be ligated. (7) Advanced carcinoma of the endometrium with uncontrollable hemorrhage. (8) Rupture of the uterus with the uterine artery torn from its origin, the internal iliac artery. (9) Placenta accreta with considerable oozing, if the patient is either very young or not in a condition warranting hysterectomy. (10) Atony of the uterus with uncontrollable hemorrhage. (Ligation may be done prophylactically, before hysterectomy, or as the only life-saving procedure if the patient is in no condition for a hysterectomy.) (11) Precipitate labor with laceration of the broad ligament, cervix and/or vagina. (12) Uncontrollable hemorrhage after cesarean section, caused by atony of the lower uterine segment, especially in conjunction with placenta praevia when the patient's condition cannot tolerate hysterectomy. (13) Operations for pelvic exenteration. (14) Placenta praevia centralis with atony and hemorrhage. (15) Severe functional uterine bleeding in which all possible organic causes have been eliminated (when a hysterectomy is contemplated; see Case 8).

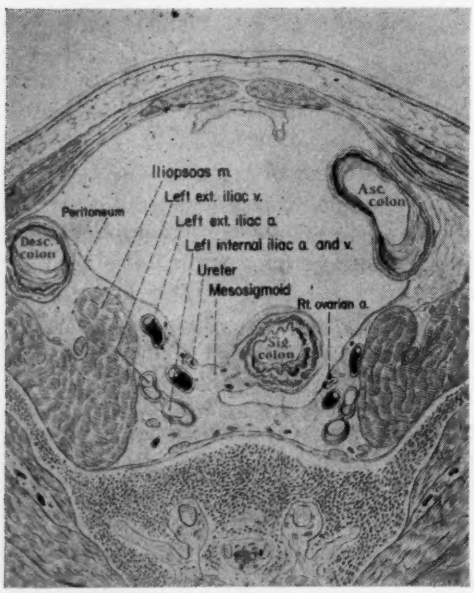

Fig. 2.—Cross section showing the sigmoid colon reflected medially and exposing external iliac artery, hypogastric artery and ureter.

Indications for Prophylaxis: (1) Huge fibroids with considerable fixation, which may require morcellation. (2) Hematomas of the broad ligament. (3) Extensive endometriosis with possible generalized oozing. (4) Extensive pelvic inflammatory disease with possible generalized oozing and bleeding. (5) Intraligamentary fibroid with bleeding and hematoma formation. (6) Fibrosarcoma, if it is possible to diagnose this tumor at the operating table, grossly or on frozen section; to minimize metastases. (7) Multiple myomectomy with extensive bleeding. (8) Radical vulvectomy to minimize bleeding. (9) Huge ovarian cysts with fixation and bleeding when total hysterectomy is done after cystectomy. (10) Couvelair uterus and a cesarean hysterectomy. (11) Abruptio placentae with atony not influenced by pitocin and ergotrate and/or fibrinolysis. (12) Abdominal pregnancy in which the placenta is implanted within the pelvic area.

Surgical Technic.—Transabdominal Approach.—Incision: The patient is placed in the Trendelenburg position. We suggest

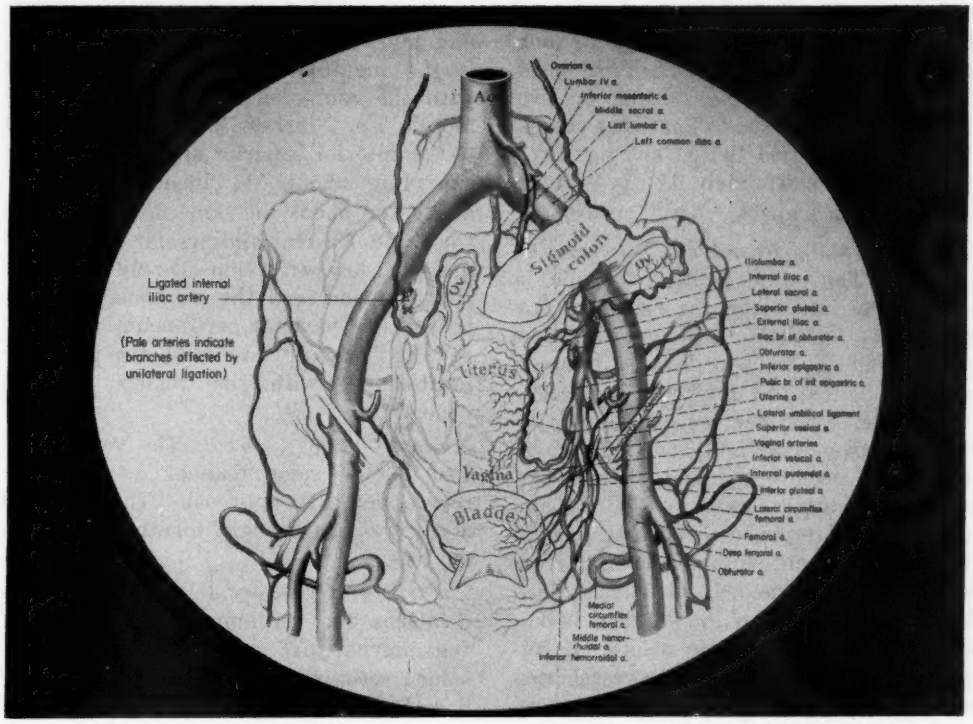

Fig. 3.—Effect on branches after ligation of right internal iliac artery. Note effect upon branches, which appear as pale outlines. Left side presents collateral circulation.

that, for better visualization, the surgeon work on the side opposite the artery to be ligated. This, however, is optional. The midline incision is preferred, since uncontrolled hemorrhage often requires bilateral ligation of the internal iliac vessels. This incision also enables one to avoid cutting any large branches of the inferior epigastric artery.

The bowel is walled off and packed as high as possible in the upper part of the abdomen. The area to be exposed must be free of any bowel or lap sponges. The ureter most often crosses the common iliac artery at the bifurcation and is attached to the posterior peritoneum. The peritoneum over the common iliac is elevated, cut, and reflected medially with the attached ureter; this exposes 3 to 4 inches (7.5 to 10 cm.) of retroperitoneal space. The abundant areolar tissue is cleared away with a grooved director, a Mixter forceps, a very small moist cotton sponge or our specially designed forceps. The pulsating arteries and the ureter are thus exposed and are all palpated and identified; the common iliac, the external iliac coursing toward the leg and the internal iliac coursing into the true pelvis. It is imperative that the operating surgeon point out the vessels and ureter several times to the assistants. The surgeon must "think out loud," for in this way the assistants will learn the anatomic character of the region and will not ligate the wrong vessel!

Ligation: The internal iliac artery is elevated with a Mixter forceps or our special forceps, and two umbilical cord ties, two strands of No. 00 silk or two Mersilene ties are used to ligate the vessel. The vessels are tied twice. The ligatures are placed approximately ¼ to ½ inch (0.6 to 1.2 cm.) apart.

We personally do not cut between the ligatures. The same ligating technic is used on the left as on the right. In our experience, ligation of the vessels stops the bleeding. We know of 2 cases in which residents ligated the external iliac artery by mistake. When the leg on the side of ligation became pale and cold, the serious error was discovered, and within two hours the ligatures were *untied;* the circulation then returned to normal. In discussing this unfortunate complication with vascular surgeons, we have gained the impression that, if the accident is discovered within six hours, deleterious effects may not occur. Had the vessel been cut between the ligatures, disastrous results would probably have followed—unless a woven Teflon graft might have been sewn into place end to end.

Closure: The peritoneum is closed with *interrupted* triple 0 catgut sutures. We do not recommend the use of a continuous suture, because it may kink the ureter. In ligating the left internal iliac artery it is usually necessary to mobilize the sigmoid flexure of the colon free from the area over the vessels. This is done by incising the lateral part of the peritoneum (the "white line") and reflecting the sigmoid flexure medially to expose the vessels. The peritoneum of the sigmoid is restored with interrupted chromic catgut sutures.

Extraperitoneal Approach.—Incision: The patient is placed in the Trendelenburg position. We prefer the extraperitoneal approach in cases of carcinoma of the cervix in which hemorrhage is intractable and must be stopped. The skin incision is the inguinal and iliac area, parallel with the course of the external oblique muscle, 1 or 2 inches (2.5 to 5 cm.) medial to the anterior superior spine of the ilium extending about 1¼ inches (3.2 cm.) above and about the same distance below the spine. The fat and areolar tissues are dissected away; a muscle-splitting incision is made, and the peritoneum is exposed. The parietal peritoneum is gently reflected medially to expose the posterior peritoneum, with the vessels palpable beneath.

Ligation and Closure: The vessels are tied in the same manner as with the transabdominal approach. The inguinal structures are brought together with silk sutures.

Postoperative Care.—In all of our indications for recommending ligation of the internal iliac artery, there is usually some serosanguineous exudate and/or hematomas to be dealt with postoperatively. We then use injectable chymotrypsin (Chymar) and oral enzyme tablets (Chymoral) as a follow-up in these cases. The anti-inflammatory effect of the chymotrypsin minimizes secondary infection, facilitates absorption of the exudates and reduces edema. While still in the hospital the patient is given an intramuscular injection of 1 cc. of chymotrypsin three times a day, and when she is able to leave the hospital she is given oral form, 2 tablets four times a day, to be taken for seven to twelve days. Antibiotics are also used in conjunction with the aforementioned preparation. In our opinion, the adjunct use of chymotrypsin enhances the action of the antibiotics.

Pitfalls.—Perhaps the biggest pitfall associated with ligation of the hypogastric arteries is *waiting too long,* until the patient's condition has become irreversible

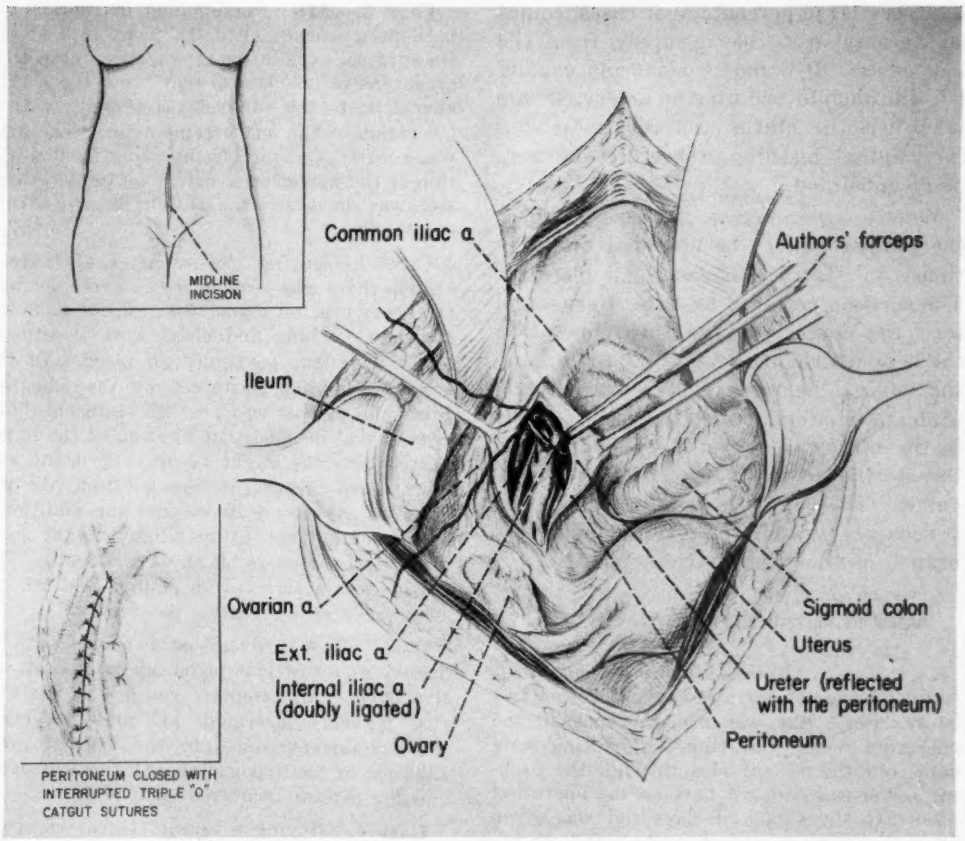

Fig. 4.—Midline incision: Exposure of internal iliac artery and its ligation. Note ureter adherent to posterior peritoneum and reflected medially. Closure of peritoneum over vessels with interrupted sutures.

and there is no chance of recovery. Allowing hemorrhage to continue without some definitive action certainly may lead to death. The anatomic environment is not difficult to cope with, and the technic is rather simple. In our opinion, therefore, everyone engaged in pelvic surgery and operative obstetrics should become acquainted with the location of the hypogastric arteries, learn to avoid the ureter and carry out the simple technic as rapidly and effectively as possible.

Another serious pitfall, perhaps, which leads to delay and neglect is that many incorrectly believe that a branch of the uterine artery always supplies the vagina: they are convinced, therefore, that when they have stopped the flow from the uterine artery the vaginal hemorrhage will also stop. Many uteri have been removed to stop vaginal hemorrhage, but when the hemorrhage continues the reason is hard to find, since the uterus has been removed and the uterine artery controlled. It is here that one must pause and refresh his memory. The vaginal artery,

in a very large percentage of cases, comes off as a separate blood supply from the hypogastric. It is independent and usually *not* a branch of the uterine artery. If one takes out the uterus and cervix to stop the vaginal bleeding, therefore, he may be disappointed.

We are acquainted with a case in which the patient had to be operated on three times for intractable vaginal bleeding. The surgeon removed first the uterus, and then the cervix; in the third operation the hypogastric artery was ligated to stop the vaginal hemorrhage. To recapitulate a simple anatomic fact, the blood supply to the uterus is delivered principally via the uterine artery, a branch of the hypogastric. The vagina is usually supplied by a separate vessel, the vaginal artery, a branch of the hypogastric artery.

BRIEF REPORT OF REPRESENTATIVE CASES

CASE 1.—A 32-year-old patient underwent vaginal hysterectomy and began to bleed two hours later. She was brought back to the operating room. Suturing and packing were done, but the patient bled through the packing. She was brought back to the operating room five times in nine days and was given 12 units of blood. On her sixth trip to the operating room we were consulted as to what could be done. Examination of the vagina revealed the entire vault sloughed; no normal tissue was present. We suggested ligation of the hypogastric arteries. This was done, and the patient recovered completely.

CASE 2.—Fourteen days after a total abdominal hysterectomy the patient (52 years old) began to bleed. She was returned to the hospital. The angle of the left side of the vagina was bleeding. It was sutured, and the bleeding apparently ceased. The patient was given two units of blood. She went home, but returned again fourteen days after the suturing, or four weeks after the original operation. At this time profuse hemorrhage occurred, and there was considerable sloughing of the vault. Hypogastric ligations were done, and the patient made a complete and uneventful recovery.

CASE 3.—After version and extraction the patient, a woman aged 27, went into shock. On surgical exploration it was discovered that an extensive left lateral tear from the cervix almost up to the fundus was present, with a laceration of the left uterine artery. The area was sutured, but the bleeding continued. Ligation of the hypogastric artery on the lacerated side was done, and the patient recovered uneventfully.

CASE 4.—During closure after a cesarean section there was *pronounced hemorrhage,* and the lower uterine segment would not contract. Massage, packing and blood were instituted, but the patient continued to bleed. In the surgeon's opinion, hysterectomy was indicated. Since the patient was only 27 years old, however, it was decided that ligation of the hypogastric arteries might be more prudent and might save the uterus. In addition, the patient was in severe shock and the additional surgical insult of hysterectomy might have precipitated irreversible shock and death. The hypogastric arteries were ligated, and the patient made an uneventful recovery.

CASE 5.—A 26-year-old woman with a history of a previous myomectomy was in active labor. An extensive rupture of the uterus, jaggedly lacerated, led into the right broad ligament and into the vaginal area. Ligation of the hypogastric arteries was done, and the patient recovered completely.

CASE 6.—During a repeat (third) cesarean section in a 27-year-old woman, it was discovered that extensive placenta accreta was present. It was impossible to find a cleavage plane and separate the placenta from its attachment. It had to be forcibly removed, and the areas in which it had been attached remained raw and bled considerably. Ligation of both hypogastric arteries was done, and the patient's uterus was saved. Recovery was uneventful.

CASE 7.—A 58-year-old white woman had a huge abdominal mass that proved to be a giant dermoid containing 2½ gallons of fluid, hair and cartilage. It was adherent to the surrounding bowel, the omentum, the mesentery and the posterior parietal peritoneum, and there was a considerable amount of oozing. After a total hysterectomy and bilateral salpingo-oophorectomy it was deemed advisable, as a prophylactic procedure, to ligate both

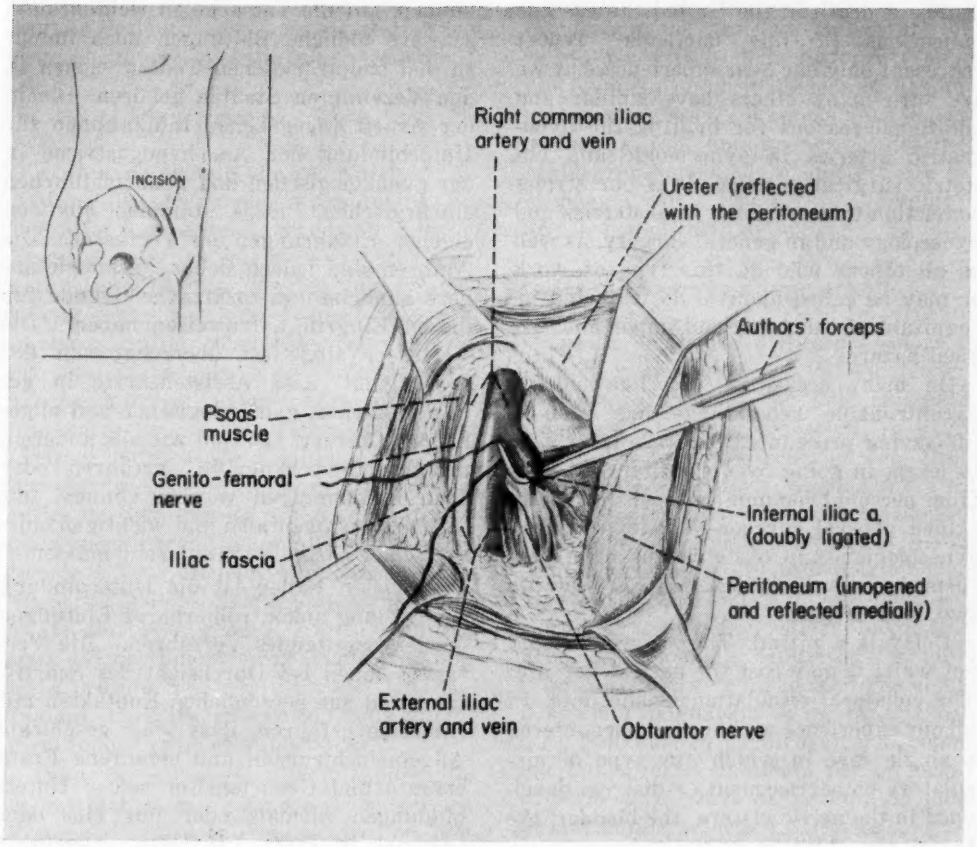

Fig. 5.—Incision in groin region on right side. Exposure of vessels extraperitoneally and ligation of internal iliac (hypogastric artery).

hypogastric arteries. This was accomplished, and the patient made an uneventful recovery.

CASE 8.—This case was called to our attention just recently. The patient was a 15-year-old girl with severe functional uterine bleeding for which all possible organic and hematologic causes were eliminated. It did not respond to any type of therapy, and a hysterectomy was performed for uncontrollable bleeding. In our opinion, bilateral ligation would in all probability have saved the uterus and stopped the hemorrhage.

CASE 9.—During a repeat cesarean section a large fetal head lacerated the cervix severely. Suturing was done, but the bleeding continued at the cervical-vaginal (right) angle. Right hypogastric ligation stopped the hemorrhage. The patient was young, and the uterus was left in. The patient was discharged on the eighth postoperative day.

SUMMARY AND CONCLUSIONS

This report is to focus the attention of those who perform pelvic and obstetric operations, as well as those who may be called upon in an emergency, on the fact that the serious hemorrhages that lead to fatalities are still among the principal

causes of death in the United States. The indications in this particular report represent only our own experience, but we are sure many others have similar and additional reasons for ligating the hypogastric arteries in gynecologic and obstetric surgical practice. It is our strong conviction that residents in obstetrics and gynecology and in general surgery, as well as all others who do this type of work or may be called upon to do it should be cognizant of this basic and important surgical hazard.

On many occasions, this ligation for uncontrollable hemorrhage has been a life-saving procedure. We were interested to learn, in going over the literature and from personal communications, that many skilled general surgeons and experienced gynecologists and obstetricians have performed no such ligation, or only one or two, in a lifetime.

Delay is a pitfall. The surgeon should not wait; it may cost the patient her life. The collateral circulation is adequate. In all our experience we have not encountered a single case in which any type of circulatory embarrassment or distress developed in the pelvic viscera, the bladder, the bowel, the buttocks or the vulva as a result of ligation of the hypogastric arteries. This applies to both unilateral and bilateral ligation. Of the cases in which we did bilateral ligations of the hypogastric (internal iliac) arteries and left the uterus *in situ*, we know of 1 in which the patient subsequently conceived. Unfortunately, she moved from this city and we were unable to obtain complete follow-up data.

ZUSAMMENFASSUNG UND SCHLUSSFOLGERUNGEN

Die Verfasser beabsichtigen mit dieser Arbeit, die Aufmerksamkeit aller, die Operationen am kleinen Becken und geburtshilfliche Eingriffe ausführen, und aller, die zu Noteingriffen gerufen werden können, auf die Tatsache zu richten, dass schwere tödliche Blutungen noch immer zu den hauptsächlichen Todesursachen in den Vereinigten Staaten gehören. Die in der Arbeit angegebenen Indikationen zur Unterbindung der Aa. hypogastricae in der gynäkologischen und geburtshilflichen chirurgischen Praxis stammen aus den eigenen Erfahrungen der Verfasser. Die Autoren sind jedoch sicher, dass viele andere ähnliche und zusätzliche Gründe für diesen Eingriff aufzuweisen haben. Die Verfasser sind fest überzeugt von der Wichtigkeit, dass Assistenzärzte in geburtshilflicher, gynäkologischer und allgemeiner Chirurgie sowohl wie alle anderen, die derartige Eingriffe ausführen oder dazu herangezogen werden können, mit diesem fundamentalen und wichtigen chirurgischen Risiko vertraut sein müssen.

In vielen Fällen ist die Unterbindung zur Stillung unkontrollierbarer Blutungen ein lebensrettendes Verfahren. Die Verfasser haben bei Durchsicht des Schrifttums und aus persönlichen Kontakten mit Interesse erfahren, dass viele geschickte Allgemeinchirurgen und erfahrene Frauenärzte und Geburtshelfer solche Unterbindungen niemals oder nur ein- oder zweimal in ihrer Laufbahn ausgeführt haben.

Aufschub ist ein Risiko. Der Chirurg darf nicht warten; es kann das Leben der Patientin kosten. Der Kollateralkreislauf ist ausreichend. Die Verfasser haben in ihrer grossen Erfahrung nicht einen einzigen Fall aufzuweisen, in dem irgendwelche Zirkulationsstörungen in den Beckenorganen, der Blase, dem Darm, dem Gesäss oder den Schamorganen als Folge der Unterbindung der Aa. hypogastricae auftraten. Dies gilt für einseitige sowohl als für doppelseitige Unterbindung. Sie hatten unter den Fällen von doppelseitiger Unterbindung der Aa. hypogastricae eine Patientin, bei der die Gebärmutter nicht entfernt worden war und die später

schwanger wurde. Unglückseligerweise zog die Patientin um, sodass weitere Nachuntersuchungen nicht erfolgen konnten.

RÉSUMÉ ET CONCLUSIONS

Le but de cette étude est d'attirer l'attention des chirurgiens pratiquant des opérations pelviennes et obstétricales et de ceux pouvant avoir à en exécuter d'urgence, sur le fait que les hémorragies graves conduisant à des issues fatales sont encore parmi les principales causes de décès aux Etats-Unis. Les indications exposées dans ce rapport ne représentent que notre propre expérience, mais nous sommes certains que nombreux sont ceux qui ont des raisons similaires et additionnelles de ligaturer les artères hypogastriques en chirurgie gynécologique et obstétricale. Nous estimons que les assistants des services d'obstétrique et de gynécologie et de chirurgie générale, ainsi que tous ceux qui pratiquent ou peuvent être appelés à pratiquer ce genre d'opérations, devraient être conscients de ce risque chirurgical fondamental et important.

Dans de nombreux cas d'hémorragies incontrôlables, la ligature a été salvatrice. Il nous a intéressé d'apprendre, en parcourant la littérature et par des communications personnelles, que de nombreux polychirurgiens habiles et des gynécologues et obstétriciens expérimentés, n'ont pas pratiqué de telles ligatures, si ce n'est une fois ou deux au cours de leur carrière.

Tout retard représente un danger. Le chirurgien ne devrait pas temporiser; il en va de la vie de son malade. La circulation collatérale est suffisante. Dans toute notre expérience nous n'avons pas rencontré un seul cas où un type quelconque de trouble circulatoire se soit produit dans les viscères pelviens, la vessie, l'intestin, la région fessière ou la vulve, à la suite d'une ligature des artères hypogastriques. Ceci s'applique aussi bien à la ligature unilatérale que bilatérale. Parmi les cas où nous avons pratiqué la ligature bilatérale des artères hypogastriques (internes iliaques) et laissé l'utérus *in situ*, nous avons connaissance d'un cas dans lequel la malade a fait une grossesse ultérieure. Malheureusement elle a quitté notre ville et nous n'avons pas réussi à obtenir de détails complémentaires.

RIASSUNTO E CONCLUSIONI

Questo articolo e' dedicato a coloro che eseguono interventi pelvici e ostetrici e soprattutto a coloro che sono chiamati a compiere interventi d'urgenza, in quanto le emorragie gravi sono ancora fra le prime cause di morte negli Stati Uniti. In questo articolo viene riferita soltanto l'esperienza personale degli autori, ma essi sono sicuri che molti altri potranno portare nuovi contributi a favore della legatura delle arterie ipogastriche negli interventi ginecologici e ostetrici. Gli autori sono convinti che ogni medico che compie il servizio di guardia in un reparto ostetrico-ginecologico o chirurgico, o comunque possa venire chiamato per un caso di urgenza deve essere al corrente di questo fondamentale principio chirurgico.

In molti vasi la legatura delle ipogastriche nelle emorragie infrenabili ha salvato la vita delle pazienti. Dalla letteratura e da comunicazioni personali risulta che molti esperti chirurghi generalli e ginecologi di fama non hanno mai fatto tale legatura o l'hanno fatta soltanto una volta o due nella loro vita.

L'attesa puo' essere fatale; il chirurgo non deve attendere, pena la vita della malata. Il circolo collaterale e' sempre sufficiente. Nella loro esperienza gli autori non hanno mai avuto un caso in cui siano comparsi disturbi circolatori o segni di insufficienza vascolare a carico dei visceri pelvici, della vescica, dell'intestino, delle natiche o della vulva come conseguenza

della legatura delle ipogastriche, e cio' tanto nelle legature unilaterali quanto in quelle bilaterali. Fra i casi sottoposti a legatura bilaterale gli autori ne ricordano uno in cui fu possibile una gravidanza successiva.

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The concept of mental diseases having a physiopathologic, organic, sometimes histologic and always endocrinologic and biochemical substratum served as a philosophic basis for the development of somatotherapies in psychiatry. In these newer treatments we cannot help but see the immense impact of the latest discoveries in histology, physiopathology, biochemistry, and physics upon psychiatric thinking.

The therapies embrace the modes of treatment that concentrate on the somatic substratum of the phenomenon of consciousness. Though the methods are empirical, they may help uncover physiopathologic data and lead to greater specificity in the treatment of mental disease by physical means as well as biochemotherapeutically. These methods, which today are fundamental, particularly in the treatment of the more malignant disturbances, can be classified into three major groups, viz., physicotherapeutic, biochemotherapeutic, and psychosurgical.

The treatment of insanity by means of agents that profoundly agitate the organism has been used in an infinite variety of empirical forms in all ages. Hippocrates, Galen, and Boerhaave, in fact, mentioned cases of mental illnesses cured as a result of febrile diseases contracted at the same time as the mental process.

We cannot consider the trepanations so profusely recorded in pre-history—like the Peruvian *huacos*—as a forerunner of present-day somatotherapy, except indirectly, for in primitive times disease was regarded not as a natural phenomenon, but as a religious and magical punishment. Trepanation was practiced to relieve those "possessed"—tormented by terrible headaches or by epilepsy—by opening a hole in the skull with a trepan or punch made of bone or sharp stone in order to allow the evil spirits possessing the patient to escape *from his head*, not from his brain, inasmuch as the latter organ was not recognized as the core of consciousness but only of the soul and of the spirits that possessed the soul.

—Marti-Ibañez

Eight Years' Experience in the Treatment of Invasive Carcinoma of the Bladder with Interstitial Radioactive Cobalt

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Interstitial radioactive cobalt in nylon sutures has been used in the treatment of 34 patients with infiltrating carcinoma of the bladder. The procedure and its results in the author's series are described. In his opinion, this form of therapy offers all the advantages of total cystectomy and none of the drawbacks.

IN THE management of carcinoma of the bladder it is necessary to have a clear concept of what one is treating and why. From the urologist's point of view there are basically only two types of tumor. The first, frequently referred to as "benign papilloma," consists of superficially growing tumors, either single or multiple. Whether these tumors are multicentric in origin, whether one is seeded from the other, or whether a carcinogen in the urine continuously stimulates the transitional epithelium to form more tumors is difficult to say. The important fact is that these "tumors" are, for practical purposes, superficially growing, and only potentially malignant. Urologists call them "benign papillomas," while many pathologists refer to them as carcinoma, Grade I. Figure 1 illustrates such a tumor, and, interestingly enough, this tumor represents a picture identical with that described by MacDonald and Lund[1] in their experimental production of vesical tumors by the use of carcinogens, for it shows what may be considered telangiectases at the base of the tumor.

The second type is the invasive and infiltrating vesical bladder carcinoma. This is usually a single tumor, and whether it belongs to the transitional cell, the squamous cell or any other type, its management is approximately the same. At times the so-called benign papillomas undergo malignant change, and then they join this second group.

It is the spreading and invasive characteristics of these tumors that are important to understand if one wishes to treat them efficiently. Jewett's extremely valu-

Read at the Twenty-Sixth Annual Congress of the North American Federation, International College of Surgeons, Chicago, May 14-18, 1961.

Submitted for publication June 2, 1961.

able contribution to urology, his "staging" of tumors of the bladder,[2] augmented by Marshall's further contribution of "stage and grade,"[3] supplies an excellent concept of the nature and prognosis of a vesical tumor, and of the management necessary to control that particular growth.

The urinary bladder changes shape and size constantly, day and night, as it fills with urine and is emptied. Tumor cells, once they have traversed the tunica propia and reached the detrusor, are thus constantly massaged, or "milked," in all directions. They are thus easily picked up by the lymphatics; they also enter the blood vessels. More commonly, and usually, they are disseminated throughout the muscle layers of the bladder, so that it is not uncommon to find tumor cells some distance from the original growth. It is because of the urologist's awareness of this fact that when he does a segmental resection of a vesical carcinoma he usually includes "a cuff of normal bladder adjacent to the tumor." That, however, is where he so frequently makes his fatal mistake. The width of this "cuff of normal bladder" depends upon how taut one pulls the bladder during the segmental resection, and how willing one is to compromise this width of the cuff when one is near a ureteral orifice or the internal urethral orifice. For an adequate segmental resection, therefore, a minimum of 4 or 5 cm. of normal bladder should be considered a "cuff" when the bladder is under moderate tension; 2, or preferably 3 cm. may suffice when no tension is present. This type of operation is therefore automatically limited to lesions on the dome of the bladder and far removed from the trigone and prostatic orifice.

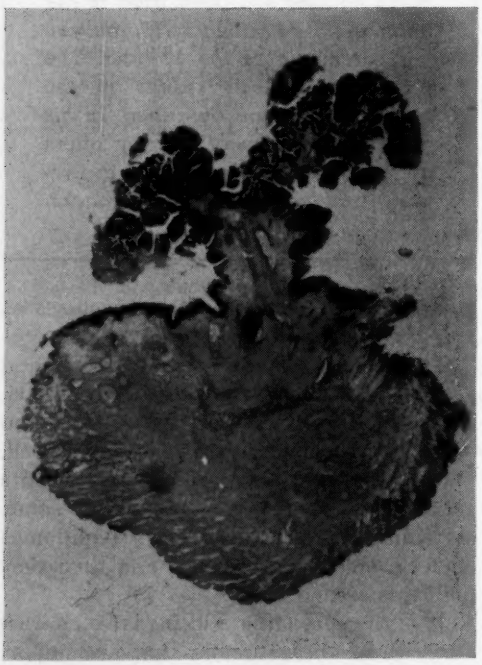

Fig. 1.—Early benign papilloma of the bladder. Note "telangiectases" at base of tumor, as described by MacDonald and Lund.

If one understands the nature and spread of tumors in the bladder wall, as aforedescribed, and if one can visualize the effectiveness of Bodner's "mucosal water barrier,"[4] it makes a transurethral resection of any tumor, even a relatively small one, an undesirable procedure unless one adopts Bodner's technic.

Only a few technical experts are able to resect all the way through the bladder wall without perforating the bladder in their attempt to remove the entire tumor. Most urologists are unable to do this. Bodner has shown that in about 70 per cent of cases, during transurethral resection of a bladder tumor—even a small papillary growth—from 100 to 300 cc. of irrigating fluid is extravasated from the bladder. If this fluid has carried viable tumor cells out with it, there is a reasonable chance that the tumor will recur in this location. In 4 of my 7 cases of "inoperable" lesions an extensive transurethral resection of the bladder tumor had been done previously, and, although the

bladder had healed beautifully, a huge mass of extravesical carcinoma was observed at the site of the resection. The other 3 patients with "inoperable" tumors had undergone segmental resection, with a similar result. Whether, in these instances, tumor had been spilled into the extravesical tissue at the time of the segmental resection, or whether the segmental resection was inadequate, is naturally difficult to say.

In 1952 I saw a man only 48 years old with an extensive infiltrating carcinoma of the bladder,[5] involving almost the entire left lateral vesical wall, down to and including the left ureteral orifice. I hated the thought of diverting the urine and doing a total cystectomy and prostatectomy, so I discussed the matter with my roentgenologic consultants, the Doctors Maxfield. They suggested the use of radioactive cobalt in nylon sutures, as devised by Morton, Callendine and Meyers[6] at Ohio State University. This was discussed with the patient, who was advised that this had never been tried before for carcinoma of the bladder but might be worth while. He agreed. Eight years ago, accordingly, I opened his bladder, sewed the sutures into the carcinoma, and hoped. Six months later there was a recurrence over the trigone, so another set was sewn into the recurrent carcinoma. Some radiation necrosis developed; it eventually healed, but from then until the patient's accidental death six years later there was no further evidence of carcinoma. He lived a normal married life with his attractive young wife; he wore no device or appliance, and he voided normally. Since then this has been my method of choice in managing infiltrating carcinoma of the bladder.

The cobalt comes in highly polished short segments of wire about 4 mm. long and 0.3 mm. in diameter (Fig. 2). These are made radioactive in Oak Ridge. This

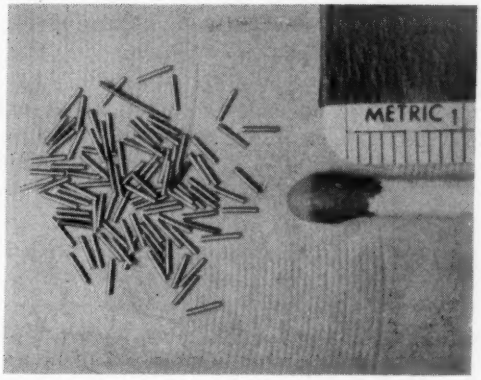

Fig. 2.—Photograph of "slugs" of radioactive cobalt.

Fig. 3.—Diagram showing placement of nylon tube sutures containing "slugs" of radioactive cobalt. Note that suture is placed as near to outside of bladder wall as is possible, without regard to intravesical portion of tumor.

radioactive cobalt has a half life of five and a half years and is consequently quite economical. These "slugs" of radioactive cobalt are introduced into a thin-walled nylon tube, each being separated from the next by an aluminum spacer of identical size and shape. The radioactive segment of the nylon tube (suture) is kept within a lead container and cold-sterilized for twenty-four hours before it is used.

At the time of operation the tumor is exposed through a cystostomy incision, and the sutures are sewn into the tumor as one would silkworm gut. An attempt

is made to place each suture parallel to, and 1 cm. from, the previous one. The first and last sutures are placed in what is considered normal vesical wall adjacent to the tumor. Each subsequent suture enters the bladder wall and exits from it at least 2 cm. from the edge of the tumor. The suture is also placed as close as possible to the outside of the vesical wall (Fig. 3), as the primary object is to destroy the carcinoma where it is invading the bladder, and little interest is taken in that portion which is within its lumen. The placement of the sutures is often facilitated by freeing the bladder so that one can hold the bladder and the carcinoma between the thumb and fingers. The sterilized lead container with the sutures can be placed on the operating table. That portion of the suture containing the radioactive cobalt remains within the lead container until all the sutures are in position. The long ends of these nylon tube sutures are brought out onto the skin (Fig. 4), so that the entire suture can be removed as one removes a silkworm gut stay suture. At the end of the operation a urethral catheter with a 30 cc. bag is left indwelling, and the bag is inflated to 30 cc. so as to separate the normal vesical wall from the portion containing the radioactive cobalt. In this way, when the tumor dose has reached 7,000 gamma roentgens, the opposite wall will have received a maximum of 1,000 gamma roentgens.

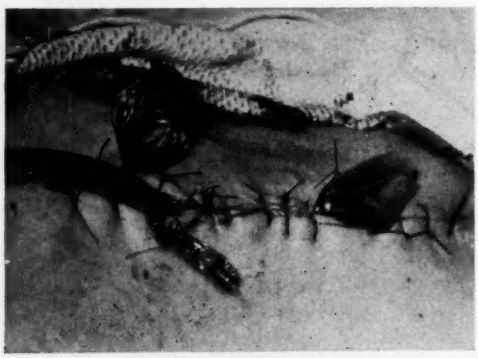

Fig. 4.—Photograph showing both short and long ends of nylon tube sutures on either side of incision.

Fig. 5.—Photomicrograph showing actively growing, infiltrating carcinoma of bladder. This was destroyed by interstitial radioactive cobalt.

My first patient, J. F., whose case has been reported,[7] had moderate dilatation of the left ureter with stasis due to obstruction by the tumor. Radioactive cobalt was sewn into the tumor, which was highly malignant, and extended almost all the way through the vesical wall. The recurrence observed six months later was due to the fact that, in placing the cobalt sutures, I had not adequately covered the carcinoma in the region of the trigone. This was accomplished in a still very actively-growing carcinoma (Fig. 5). Three years later the pyelogram was normal and during the remaining six years of the patient's life he never again had any sign of carcinoma, nor did he at the time of his death, which resulted from an automobile accident.

Another patient of mine, A. St.A., had, as may be seen in Figure 6, highly anaplastic carcinoma. He died of liver failure five and a half years after radioactive cobalt had been sewn into the carcinoma. At autopsy the liver was almost completely replaced by tumor. Metastases

were everywhere. The only organs in which no carcinoma was present were the kidneys, ureters and bladder. These were normal. He too, like my first patient, lived a normal, happy married life with no diversion of urine, no hematuria and no symptoms whatever, for nearly six years.

Another patient who is still alive and well almost six years after her treatment with radioactive cobalt is Mrs. M. L. When she was first seen, the bladder had a capacity of less than 2 ounces. A third of the organ was involved in a squamous cell carcinoma. The rest was an extensive area of leukoplakia (Fig. 7, *A* and *B*). She is now well with no discernible evidence of carcinoma. The bladder has a capacity of 10 ounces. She does, however, have bilateral reflux.

These 3 cases are described, in brief, just to emphasize the point that a Marshall-Jewett stage B_2, Grade 3 or 4 tumor can be cured locally with interstitial radioactive cobalt, leaving the patient with a normally functioning urinary tract. This gives the same degree of "cure" or palliation as though the patient had undergone a complete cystectomy, plus diversion of urine, without the necessity of making him an asexual human being who must wear a "device."

During the past eight years I have treated 34 patients who had actively growing, infiltrating, anaplastic carcinoma of the bladder with interstitial radioactive cobalt in nylon sutures. With only a few exceptions, the patients were all treated with the help and cooperation of my roentgenologic consultants, Dr. J. R. Maxfield Jr. and Dr. J. G. S. Maxfield, of Dallas. At the time set for operation, 7 of the 34 patients proved hopelessly inoperable, as in each case the tumor was a huge mass outside the bladder and invading the adjacent structures. All 7 had undergone previous surgical treatment; in 3 cases segmental resection of the bladder and in 4 transurethral resection of the tumor. In 1 of these the tumor had invaded the pelvic

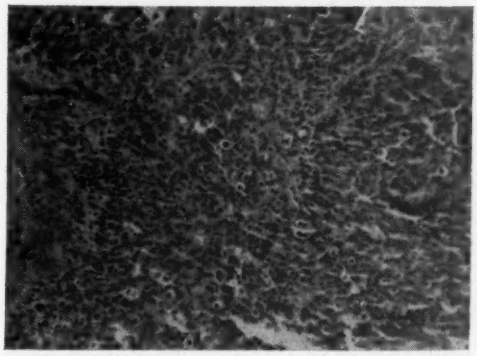

Fig. 6.—Photomicrograph of anaplastic, actively growing, invading carcinoma of bladder which, at autopsy five years later, was found to have been eliminated by radioactive cobalt in nylon sutures.

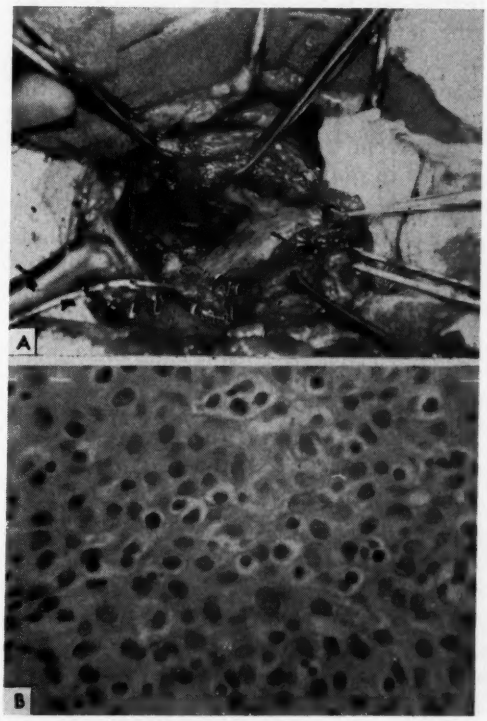

Fig. 7.—*A*, photograph made at time of operation, showing squamous cell carcinoma of bladder. Remainder of bladder shows leukoplakia. *B*, photomicrograph of tumor shown in *A*, revealing actively growing squamous cell carcinoma.

wall (Fig. 8*A*), so that a biplanar implant of radioactive cobalt (Fig. 8*B*) was sewn into the tumor. After this, the patient lived for a year in relative comfort before he died. Another underwent segment resection of the bladder with reimplantation of the ureter into the bladder, with radioactive cobalt sewn into the suture line. She also lived for a year without pain or discomfort. In the remaining 5 cases the entire tumor mass was excavated and radioactive cobalt sewn into the wall of the tumor that remained. They all died three to eight months from the date of operation. These 7 patients were hopelessly inoperable, but the treatments were attempts at palliation only, to determine whether massive local irradiation would prove beneficial in any way. All did obtain some palliation. One died four months after the operation from a massive hemorrhage from the bladder, presumably secondary to radiation necrosis.

Of the remaining 27 patients, 15 are alive and well, with no cystoscopic or clinical evidence of tumor. One has distant metastases, but there is no cystoscopic or palpable evidence of local recurrence. Four others are dead, 1 two months from myocardial infarction, one four months, one five years and one six and a half years after implantation of the tumor with radioactive cobalt. Autopsy revealed no tumor in any of these patients. One of those who is still living underwent cystectomy two years after the use of interstitial radioactive cobalt. His bladder was observed to be free from tumor, and so were the liver and the pelvic lymph nodes. Thus, 19 out of 27 patients treated with interstitial radioactive cobalt had, or have, no evidence of carcinoma. Of the 15 who are alive and well with no clinical evidence of carcinoma, 1 has lived one year since irradiation; 2, two years; 2, two and a half years; 2, three years; 2, three and a half years; 1, four years; 1, five years; 2, five and a half years; 1, six years, and 1, six and a half years. Of the remaining 7 only 1 is alive, and he has a recurrent tumor invading the prostate. The other 6 have died of tumor. Interestingly enough, only two of these had recurrent tumor in the bladder before death. Both recurrences were in the region of the old cystostomy incision. Both patients underwent subsequent segmental resections of the recurrent tumor, and radioactive cobalt sutures were sewn into the bladder on both sides of the resected area. At autopsy the bladder was normal and uninvolved. In all these patients tumor was observed extravesically, and in most of them the tumor was in the periaortic lymph nodes and the liver. In 2, metastatic tumor was also observed in the kidney.

Of the 34 patients, only 2 subsequently underwent cystectomy with ileal loop diversion for frequency and urgency of urination. One is a patient in whose case radioactive cobalt was implanted; on removal of the sutures, one broke and left a radioactive cobalt seed remaining immediately underneath the trigone. There were no symptoms or discomfort from this for the first eighteen months following the operation; then frequency and urgency of urination occurred and became so pronounced that the patient's local surgeon did a cystectomy and ureteral transplant into an ileal loop on the assumption that he had recurrent carcinoma. The pathologist, however, was unable to find any evidence of tumor in the excised bladder and prostate. The other patient originally had such a large infiltrating tumor that ten sutures of radioactive cobalt were used to cover the area of carcinoma. A year later diversion of urine was done because of frequency and urgency of urination and a small bladder capacity. He died six months after the diversion, and at autopsy it was observed that "the condition of the bladder was very

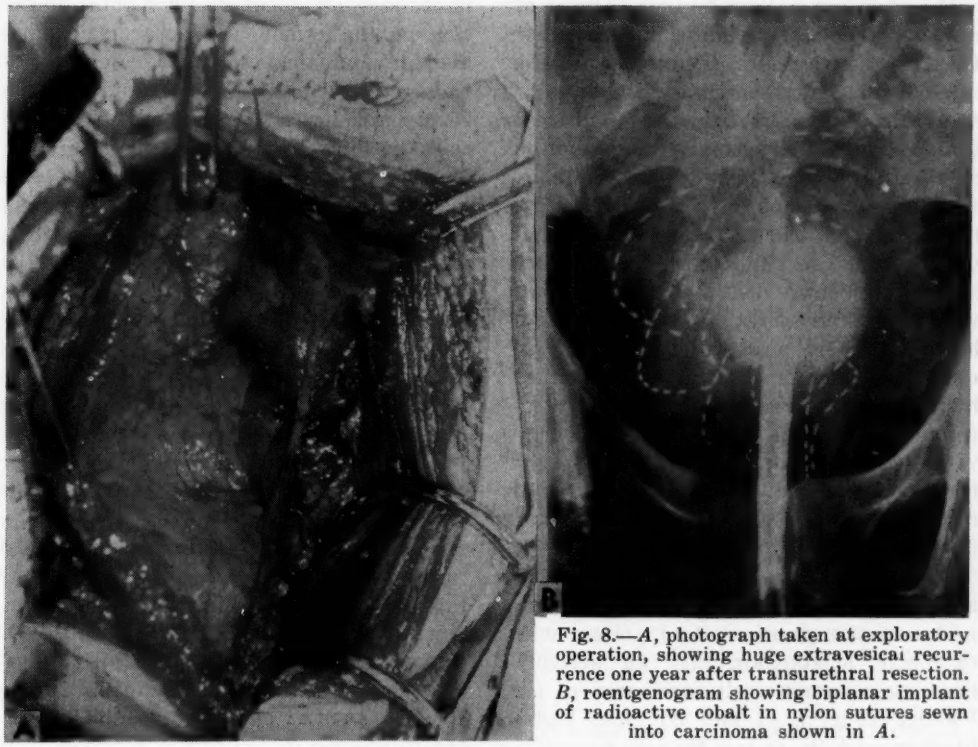

Fig. 8.—*A*, photograph taken at exploratory operation, showing huge extravesical recurrence one year after transurethral resection. *B*, roentgenogram showing biplanar implant of radioactive cobalt in nylon sutures sewn into carcinoma shown in *A*.

interesting inasmuch as on gross (and later on microscopic) examination no evidence of tumor existed. The wall of the bladder itself was markedly contracted and small. However, there was extensive involvement of the retroperitoneal and periaortic lymph nodes by tumor. On the left side a sheet of tumor existed which enveloped the large vessels of the abdomen, as well as the lower pole of the left kidney. There was a hydronephrosis on the left side with pinpoint opening of the ureter into the ileal loop. Numerous abscesses of the left kidney were apparent. On the right side the ureter was normal, but the kidney was almost entirely replaced by tumor."

In all these patients the dose of radiation was carried to 7,000 gamma roentgens as calculated by the Parker-Patterson tables. Unfortunately, this calculation has to be only approximate, as it is extremely difficult to place the sutures accurately, 1 cm. apart and parallel to each other, even with the aid of roentgen examination during operation. When this is done one can correct gross discrepancies in positioning the radioactive cobalt sutures, but even then one is sometimes amazed, forty-eight hours later, to see some sutures too close together, some too far apart and some not parallel. Because of this, or because of the very large number of sutures sometimes used, giving massive radiation, 15 of the 34 patients have had some local radiation necrosis. Most of the ulcers have healed in nine months to a year. Four of the patients who died within a year after the operation still had extensive radiation necrosis at the time of autopsy.

My very first patient had six sutures of radioactive cobalt implanted in November 1952, and because of recurrence of the tumor near the trigone a second series of five sutures was sewn into the recurrent tumor. As was expected, some radiation necrosis developed. The ulcer gradually healed over a period of two years. Despite this the patient had a bladder capacity that varied from 8 to 12 ounces up to the time of his accidental death, six and a half years after the operation. At the time of his death there was still no evidence of recurrent tumor. In 2 others, who had had previous irradiation (1 with gold-radium emanation seeds and 1 with conventional high voltage therapy), radiation necrosis developed. In 1, four sutures of radioactive cobalt were used; in the other, five.

In spite of the localized ulcer with sloughing, the bladders of these patients had normal capacities. In 1 patient with extensive leukoplakia and an actively-growing squamous cell carcinoma of the bladder (Fig. 7, *A* and *B*), who had a bladder capacity of less than 2 ounces before the radioactive cobalt was implanted, a capacity of 10 to 12 ounces developed within two years. Four years after the implantation of radioactive cobalt she was cystoscopically and clinically still free from tumor. Osteitis pubis developed, for which the radiologist in her home town gave her radiation therapy. Within three months the bladder's capacity was again down to 2 ounces. This again gradually increased since that time. Now, five and a half years after the operation, the bladder capacity is adequate, but the patient has bilateral ureteral reflux, as has been mentioned, with bilateral pyelonephritis and hydronephrosis.

In instances of large, extensive growths that require eight or more sutures of radioactive cobalt, I have at times modified my technic. When technically possible I have done an adequate segmental resection of the tumor and adjacent normal bladder and then sewn two sutures of radioactive cobalt on either side of the suture line to destroy any possible tumor cells that may have been left behind (Fig. 4). In this way, the patient can receive more than adequate radiation without an excessive, massive dose. I hope also that, as I usually place the suture near the outside of the bladder wall rather than near the mucosa, any tumor cells that may have spilled adjacent to the bladder wall will also be destroyed. So far I seem to have been fortunate. If these tumors have not already invaded through the bladder wall, the possibility of implanting tumor cells in the perivesical tissue must be borne in mind.

From this survey one must conclude that interstitial radioactive cobalt implants into an actively growing, infiltrating carcinoma of the bladder will eradicate local growth and leave the patient with a normally functioning bladder, and that if the tumor has not extended beyond the bladder the prospects of a cure are as good as if one had done a total cystectomy with urinary diversion of urine, if not better. The procedure also leaves the patient with the added great advantage of voiding normally and continuing a normal sex life.

SUMMARY

During the past eight years, 34 patients with infiltrating carcinoma of the bladder have been treated with interstitial radioactive cobalt in nylon sutures. Of these, 15 are alive at the time of writing, with no clinical or cystoscopic evidence of recurrence. One is alive but has a tumor growing in his prostate. Another has no local recurrence but does have distant metastases. Seventeen have died. Seven were hopelessly inoperable and died of their tumors. Of the remaining 10, 6 died from extension of the tumor, but with no local

recurrence in the bladder. Three died with no demonstrable evidence of tumor at autopsy. One died two months after irradiation, with no tumor visible cystoscopically. No autopsy was performed.

Of the 27 patients with operable tumors, Marshall-Jewett stage B_2 and C, Grade 3 and 4, 4 had recurrent tumors in the bladder. One, the first patient, had a second set of sutures sewn into the recurrence. Two others underwent segmental resection for recurrent tumor, with implantation of radioactive cobalt in the suture line. The fourth still has carcinoma growing in his prostate.

At present, 25 of the 27 patients are either alive with no clinical or cystoscopic evidence of tumor or have died with no tumor in the bladder. Only 1 has a local recurrent tumor.

Treating infiltrating carcinoma of the bladder with radioactive cobalt in nylon sutures has all the advantages of total cystectomy with none of its disadvantages.

RIASSUNTO

Negli ultimi 8 anni sono stati trattati 34 malati con carcinoma infiltrante della vescica mediante cobalto radioattivo in suture di nylon. Dai risultati ottenuti l'autore conclude che questa forma di trattamento ha tutti i vantaggi della cistectomia totale e nessuno degli svantaggi.

RÉSUMÉ

Trente-quatre malades atteints de carcinome infiltrant de la vessie ont été traités au cours des huit dernières années avec du cobalt radio-actif interstitiel dans les sutures de nylon. D'après les résultats statistiques obtenus, l'auteur conclut que cette forme de traitement présente tous les avantages de la cystectomie totale sans aucun de ses inconvénients.

RESUMEN

En los últimos 8 años han sido tratados 34 casos de cáncer infiltrante de la vejiga con cobalto radiactivo intersticial en puntos de nylon. Sus estadísticas indican al autor que este método tiene todas las ventajas y ninguno de los inconvenientes de la cistectomía total.

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Patience sometimes obtains of men what they never meant to grant. A fit moment may even constrain the most faithless persons to redeem their false promises.

—*Vauvenargues*

Anococcygeal Prostatectomy

A Posterior Perineal Approach to the Prostate

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THE classic surgical approaches to the prostate, ischiorectal, perineal, retropubic, suprapubic and transurethral, in their chronologic evolution, have been useful, according to urologic experience.

Transurethral resection is not always a complete operation. Its results, moreover, are often unsatisfactory in cases of long-standing obstruction, distention of the bladder, multiple diverticula, chronic infection, pyelonephritis, etc. Transurethral resection is not performed skillfully by all urologists. The size of the prostate is another limitation to its use. The technic is difficult to learn. Recurrence of the obstruction leads frequently to a series of resections for the same patient.

Controversy over suprapubic versus perineal prostatectomy has shown that the latter is still practical and anatomically sound, affording good exposure of the prostatovesicular area.

In a considerable number of cases, however, it carries complications, such as incontinence; impotence due to injury of the nerves of the inferior hypogastric ganglia and/or disturbances of the perineal support, and rectourinary fistulas.

The disadvantages of the retropubic approach are osteitis of the pubis; sclerosis of the vesical neck; suprapubic fistulas, and postoperative hemorrhage difficult to control unless the bladder is "reopened." Voelcker used the ischiorectal fossa in surgical treatment of the prostate. In the hands of Darget and Gil Vernet this technic has acquired new value. Couvelaire, who uses a slight modification of this method, has published valuable statistical information. Ortega and Gil Vernet use one justasphinteric incision and, following the rectum laterally, reach the ischiorectal fossa. Ortega has reported 200 prostatectomies performed through different perineal incisions. Twenty of these were done by the coccygeal technic presented in my first report (1956).[1a] There is no ideal way to remove the various pathologic prostatovesicular lesions. For this reason some considerations are brought forward here.

My experience with the resection of erector nerves through the ischiorectal fossa permitted me to observe the accessibility of the prostate once the rectum is laterally retracted.

Technic.—Preparation: Preoperative preparation includes routine studies of the

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Submitted for publication Sept. 2, 1960.

Fifty cases of anococcygeal prostatectomy for adenoma and 2 of radical prostatovesiculotomy for carcinoma are reported. A description of this technic and a discussion of its advantages and disadvantages in comparison with other types of prostatectomy are included.

patient's general condition, blood and urinary tract, as well as control of any present infection. Soapsuds enemas, sedatives and antibotics, are employed and cardiocirculatory preparation, is done.

The basic instruments needed for this operation are the same as those employed in the usual prostatectomies. Special instruments are the De la Peña or the Van Buren metallic sound; the bougie of May, and a simple lithotritor (small size) used for propulsion of the prostate;* the needle holders of Ortega, and the boomerang type. I never use a prostatic special retractor, as I deem it unnecessary.

Anesthesia: Thirty-four patients have been operated on with spinal anesthesia. For those in the last series I employed pentothal and a closed technic (ether and oxygen, etc.). The position of the patient is a factor of great importance. Instead of the ventral decubitus position (Voelcker, Thiermann, Couvelaire) with the thigh flexed over the pelvis and in adduction. I use a more comfortable and more urologic position, the decubitus supinus, with the thighs in abduction and maximally flexed over the abdomen. The position can be obtained by using Belt's sliding fixture or a simple lumbar elevator. This position is the usual one employed in vaginal ureterolithectomy and resection of the erector nerves. Its advantages are (1) a special operating table is not needed; (2) cephalad displacement of the abdominal viscera is obtained, and (3) the prostate is exposed more easily than with other methods. From the anesthesiologist's point of view, it represents a distinct advantage.

Procedure.—The perineal region, scrotum and penis are meticulously disinfected as usual. An operative field 15 by 8 cm. should expose the area between the ischial tuberosities and the coccyx and anus. This area should be carefully draped. An antiseptic towel is also wrapped around the penis. The bladder is emptied. One small lithotritor (20-22) sound is introduced through the urethra for propulsion of the prostate toward the operative field, thus bringing the posterior aspect of the prostatovesicular block to the perineal (incised) surface.

2. A transverse incision 8 to 12 cm. long is made midway between the coccyx and the anus and carried through the skin and the cellular subcutaneous tissue. Hemostasis is secured.

3. The anococcygeal raphe is sectioned; the left ischiorectal fossa is entered by blunt dissection. If the operative field is too small it can be enlarged by a small complementary incision of the gluteus maximus. The levator anus, which divides this fossa into two compartments, superior and inferior, is laterally retracted.

4. The prostate is brought to the surface with the aid of the urethral instrument (lithotritor or metallic sound) and dissected, and the site for the capsular incision is chosen. The lateral aspects of the prostate are examined; with the index finger the puboprostatic ligaments are easily palpated. Manipulation of the urethral sound or lithotritor, places them under tension so that a sharp sensation is conveyed to the palpating finger. The lateroprostatic group of veins is visualized toward the lateral aspect of the prostatic capsule. Incision of the capsule below these veins can injure the rectum. The area for the capsular incision must be superior to the veins, avoidance of which will obviate the need of fulgurations and ligatures.

5. Incision of the surgical capsule to 4 by 6 cm. for adenomectomy, shows a marked difference in aspect and color, between it and the whitish adenoma. The

*We have found that for propulsion of the prostatovesicular structures, bladder trigone, etc., in prostatectomy, prostatovesiculectomy and vesicovaginal operations, the usual lithotritor (Bigelow, etc.) affords the ideal solution. It is inexpensive, easy to introduce, to care for and withdraw; steady, once opened; nontraumatic, firm and sturdy.

plane of "cleavage," therefore, is plainly visible.

6. Dissection of the adenoma with scissors, if one follows that plane, is easy and section of the urethra is performed under direct vision. The metallic sound is then removed, and the adenoma, picked up with forceps, is finally enucleated by sharp dissection: the mucosa at the vesical neck is cut with scissors. The prostatic fossa is carefully checked for small adenomatous lobes, tags, etc. The neck of the bladder is perfectly visualized; rather voluminous vesical stones may be extracted through it. V-shaped or annular resection of the vesical neck with scissors or Rouaut's tonsil rongeur is done in cases of sclerosis, to avoid postoperative trouble and operation.

7. Four stay sutures No. 1 chromic catgut are placed at 12, 3, 6 and 9 o'clock respectively at the vesical neck and are used for hemostasis and to approximate this structure to the membranous portion of the urethra. A No. 22 plastic catheter is passed through the latter. The tip of the catheter is brought out through the incision and held with a retractor (Belt), to facilitate the suture at 12 o'clock. The catheter is then passed into the bladder, and the three other sutures are tied. The capsular incision is closed with either interrupted or continuous sutures. If there is redundancy due to a large adenoma it may be plicated or partially resected. The bladder is irrigated, and the probability of leakage is appraised.

8. The muscles are approximated with interrupted sutures. A small plastic tube is inserted for drainage. The plastic tube can also be used for local instillation of antibiotics. The skin is closed with interrupted sutures. Collodion or Aeroplast is used to prevent contamination of the wound from the neighboring anal area.

Postoperative Care.—The wound is dressed every twelve hours. An infra-red lamp (Belt) is used to keep it dry. The bladder can be irrigated through the urethral catheter with sterile solution and with antibiotics. Hyaluronidase mixed with an antibiotic is instilled through a small plastic tube in the ischiorectal fossa. The catheter is removed in four or five days and is replaced if urine is leaking. It is kept indwelling until the incision is firmly closed. The skin sutures are removed after eight days.

I have operated by this method in 52 cases. The youngest patient was 46 years old and the oldest 81. The average age was 65. Two underwent radical prostate veniculectomy for adenocarcinoma. Impotence was not a trouble and was related to the age of the patient. The postoperative results were comparable to those offered by the most widely favored suprapubic technic.

Temporary incontinence was present for a week in 3 cases. Up to the time of writing, permanent incontinence has not been observed. All patients were out of bed on the third or fourth postoperative day; the stay in the hospital was two weeks.

The average weight of the prostates removed was 65 Gm. The largest weighed 180 Gm. and the smallest 30 Gm.

In 4 cases concomitant vesical calculi were removed from the bladder. Their sizes varied between 7 by 4 by 3 cm., and their weight, from 22 to 7 Gm.

Mortality Rate.—Three patients died. One of them, 76 years old, was in bad general condition and decidedly obese. A massive hemorrhage of the bladder occurred, with obstruction of the urethral catheter, away from the habitual environment and team. A cystostomy was performed and a suprapubic drain placed. The hemorrhage did not cease, and in spite of repeated transfusions the patient

died sixteen hours after the operation, of peripheral circulatory insufficiency. The other 2 died of circulatory collapse four and six days respectively, after the operation. The 3 were included among my first 10 anococcygeal operations.

COMMENT

The advantages of the technic here presented seem worth consideration. The retrosuprapubic approach (Freyer, etc.) technics, seems more shocking, less technical. The anococcygeal approach seems easily tolerated even by patients of advanced age and in poor general condition. Section of the anococcygeal raphe without resection of the coccyx provides a wider operative field than do anterior perineal technics. The prostatolateral vessels, the central perineal "nucleus" inferior hypogastric ganglion and the ganglia of Walker are preserved. The periprostatic veins are easily visualized and amenable to retraction. It is easy to make a sound leakproof suture of the urethra and the vesical neck. Suture and plication of the prostatic capsule helps in controlling postoperative bleeding and prevents the formation of "dead space." Resection of the posterior lip of the vesical neck reduces the incidence of postoperative sclerosis observed when other methods, requiring fulguration and hemostatic suturing in excess, are used.

Two patients, mentally disturbed, pulled out the urethral catheter in a violent manner on the second postoperative day. Normal urination occurred without reinsertion of the catheter.

The posterior perineal approach, preserving the anterior perineal Denonvilliers aponeurosis, the central tendon of the perineum and the regional nerves, eliminates anatomic and functional disturbances, which explain the impotence and incontinence. Neither hernia nor rectal prolapse due to resection of the coccyx (Thierman, Kraske, Darget) occurs with this method. It is important to mention the absence of impotence, which often follows use of the anterior perineal technic—of the major objections in cases of early prostatism. Thus far I have not observed any pubic osteitis, significant elevation of temperature, phlebitis or septicemias. There are no technical difficulties even in cases of pronounced obesity.

The opinion of Gil Vernet is that the technic here described is less traumatic than are the classic perineal prostatectomies. It is very simple, and it enables one to avoid rectourinary fistulas and postoperative incontinence.

Ortega of Guayaquil (Ecuador) is also an enthusiast for the anococcygeal technic. His large experience with the lateral juxtasphincteric lends great value to his judgment: "The section of the anococcygeal raphe affords a wider field, superior to any classical known method." "Therefore a perfect visibility is reached." "Such visibility prevents trauma of the delicate neurovascular periprostatic structures."

The anococcygeal approach, in my opinion, is a logical method of adenovesiculectomy and prostatovesiculectomy. As a rule it requires no muscle incision (in certain cases, of obesity, a minimal incision of the gluteus maximus may be required).

The results with this technic in my hands seem excellent. The anococcygeal approach offers an unsurpassable field of manipulation for radical operation (prostatovesiculectomy).* The only disadvantage of this approach is the possibility of contamination from the rectum with delayed healing of the wound. Meticulous care in dressing the wound obviates it.

*By this approach the field of operation is as easy of access in the male patient as a similar area in a female patient undergoing a transvaginal procedure.

ZUSAMMENFASSUNG

Es wird über 50 Fälle von Prostataresektion wegen Adenoms und über zwei Fälle von radikaler Resektion der Prostata und der Samenbläschen wegen Karzinoms berichtet, bei denen die anococcygeale Technik angewendet wurde. Das Operationsverfahren wird beschrieben und seine Vorzüge und Nachteile, gemessen an anderen Formen der Prostataresektion, werden erörtert.

RÉSUMÉ

Cinquante cas de prostatectomie anococcygienne pour adénome et deux cas de prostato-vésiculotomie radicale pour carcinome sont rapportés. L'auteur y joint une description de cette technique et une discussion sur ses avantages et inconvénients par comparaison avec d'autres techniques de prostatectomie.

RESUMEN

Se presentan cincuenta casos de adenoma prostático tratados con una prostatectomía anococcígea, y dos carcinomas de próstata en los que se practicó una próstatovesículotomía radical. Se describe la técnica quirúrgica de estas operaciones y sus ventajas e inconvenientes respecto de otras operaciones en la próstata.

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Men who allow their love of power to give them a distorted view of the world are to be found in every asylum: one man will think he is the Governor of the Bank of England, another will think he is the King, and yet another will think he is God. Highly similar delusions, if expressed by educated men in obscure language, lead to professorships of philosophy; and if expressed by emotional men in eloquent language, lead to dictatorships.

The success of insanity, in literature, in philosophy, and in politics, is one of the peculiarities of our age. And the successful form of insanity proceeds almost entirely from impulses towards power.

—*Russell*

Diseases of the Lumbar Portion of the Spine

The Roentgenologist's View

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The author discusses the roentgen anatomic aspects of the lumbar portion of the spine and their significance in roentgen diagnosis. He emphasizes the importance of thorough embryologic, physiologic, neurologic, anatomic and pathologic knowledge and of full and complete roentgen studies, which, in his opinion, should be more widely used in the diagnosis of the intervertebral disc syndrome.

PAIN is a common complaint and one that the physician is called upon to treat constantly. One area of the human body that is not overlooked by the patient is the lower part of the back. While it is fashionable nowadays to attempt to explain almost every symptom on a psychosomatic basis, not too long ago backache was considered, in most instances, a symptom of fatigue, and in the not too distant past the intervertebral disc was considered the arch villain in the production of pain in the back.

Both the moderns and the ancients, and even many aborigines, attribute pain to the abnormal intrusion of objects or spirits into the body. Inflammation undoubtedly provides many biochemical factors not yet fully analyzed or comprehended. The mechanisms of pain are now better understood, however, and the three most important causative factors, which act in a reciprocal fashion, are the incoming impulses from the periphery, the internuncial pool activity and the impulses from the lateral and anterior horn cells that are brought within the influence of this internuncial pool.[1]

Medical diagnosis is an amalgam of synthesis as well as analysis. Diagnosis must take into account not only the tissues and organs of a region but their derivation, their function and their composition. It is for these reasons that it is considered worth-while and desirable to review some of the elementary principles of the subject at hand.

Although the human spinal column is similar to that of the anthropoid apes, it demonstrates many adaptations due to man's plantigrade method of progression. After birth, the lumbar region of the spine grows more rapidly than does either

Submitted for publication May 12, 1961.

the dorsal or the cervical, so that it forms an elongated flexible pillar for the support of the upper parts of the body. In the anthropoid apes the lumbar portion of the spine remains relatively short, as it does in the new born human being.

The fetal vertebral column presents only one curve, and that curve is convex posteriorly. This primary curve persists in the dorsal region, developing into a flexible bend at the juncture of the cervical and dorsal regions and a sharp angle at its juncture with the sacrum. After birth two secondary curves are added; both convex forward, one in the cervical and one in the lumbar region. The lumbar curve appears as the child learns to walk, and it allows the weight of the body to be brought vertically over the lower extremities. At the same time, the cervical and lumbar curves become more pronounced. When the adult bends his neck, the cervical portion of the spine tends to assume the fetal configuration.

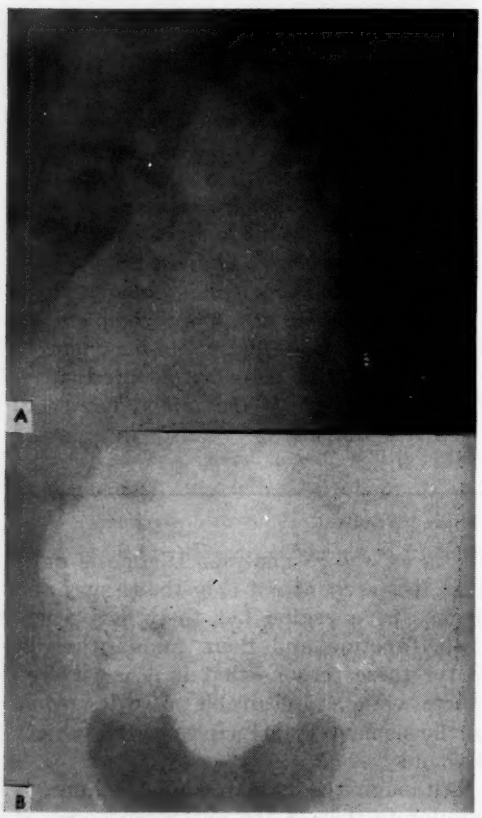

Fig. 1 (Case 1).—Mr. L. B., aged 52. Trauma to lower part of back. Note infantile type of lumbar lordosis with poorly marked sacrovertebral angle and tumor masses of mixed chondral tissue formations, considered result of maldeveloped sclerodermal mesenchyme.

In man, the vertebrae increase in size from head to sacrum. This increase in size corresponds to the increased weight each vertebra has to bear. (The fourth dorsal vertebra is an exception.) The early vertebrate forms that developed in water had their largest vertebrae at the level of the pectoral fins; the vertebrae then diminished in size as they extended caudally. In pronograde mammals the vertebrae that are supported and buttressed by the forelegs and hindlegs are under the greatest stress and have larger and stronger bodies and processes.

In vertebrates, the musculature that enters into the formation of the body wall of the embryo, the somatopleure arises from the muscle plates of the somites. These are situated along each side of the dorsal median axis of the body. These muscle plates split into a dorsal or vertebral system and a ventral system. The middle layer of the lumbar fascia develops between the dorsal (epaxial) and the ventrolateral musculature. Some of the ventrolateral muscles, such as the trapezii, the rhomboids, the levator scapulae and the latissimus dorsi, migrate dorsally over the epaxial muscles and take origin from the vertebral spines. Their nerve supply "gives away" their true origins.

The primitive metameric or transverse segmental disposition is present only in the trunk. The muscle plates are derived from each segment and, as they grow into

the limbs, undergo an extensive redistribution but retain their original nerve supply. This may account, in part, for the development of large nerve plexuses. The limb bud nerves are actually the lateral cutaneous branches of the true segmental nerves. The first outgrowth of the limb bud is derived from the mesoblast of the body wall, not the axial muscle plate. As the limb bud grows out, it carries the skin with it, and thus they both become displaced from the midline. The segments of skin, both behind and in front, close in to fill this potential gap. This accounts for the sudden jump in segmental nerve supply in such regions as the upper portion of the thorax, where the fourth cervical nerve is distributed adjacent to the second thoracic. Since the perineum is developed behind the limb buds of the inferior extremity, its nerve supply is from the most caudal segments of the cord.

The spinal cord is not a perfect cylinder. Its diameter is not the same throughout its length, and it has two swellings (*intumenescentiae*), cervical and lumbar. The cervical bulge is larger than the lumbar, and both enlargements are related to the development of the limbs. The vertebrae about the intumenescentiae are somewhat thinner than they appear.

In early fetal development there occurs a segmental concentration of mesoblasts about the primitive spinal canal. In the center of this is embedded the notochord (Sir Arthur Keith's evocator), but only between the centra where the intervertebral discs are formed does it persist in its primitive form and here it expands and forms a considerable part of the central mucoid plug that each disc contains, the nucleus pulposus.

The ossification of each vertebral body takes place from two adjacent centers that unite rapidly from the eighth to the sixteenth intrauterine week. The unossified portions between the vertebrae enclose the remnants of the notochord and form the intervertebral disc. Thus it happens that the body of each vertebra is formed and derived from the mesenchyma of two adjacent segments of the body.

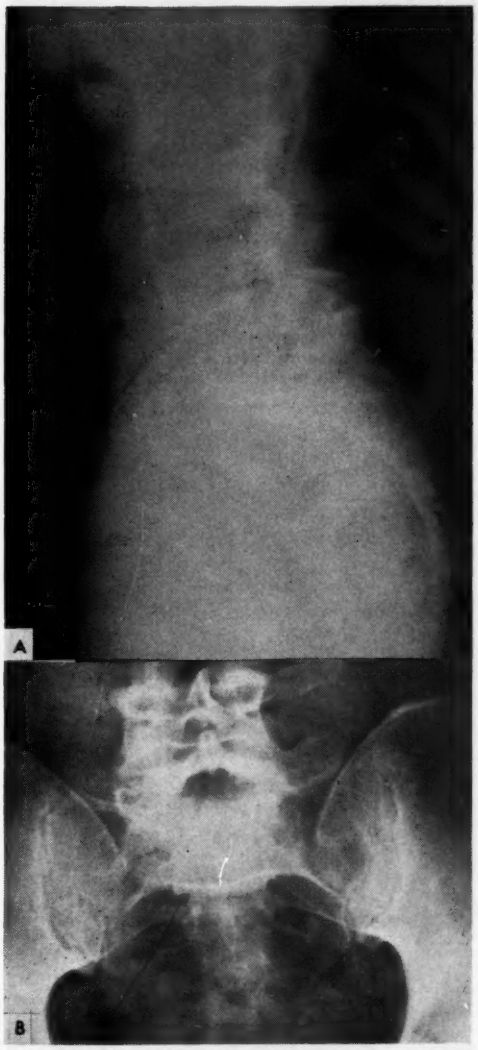

Fig. 2 (Case 2).—L. Sc. Low back pain. Neural arch defect, and spondylolisthesis, demonstrating Brailsford's bow line in anteroposterior projection.

While the human vertebral formula is

Fig. 3 (Case 3).—Mrs. W., aged woman with history of trauma; spondylolisthesis of fourth on fifth lumbar vertebra, with disc degenerative disease; no defects of neural arch.

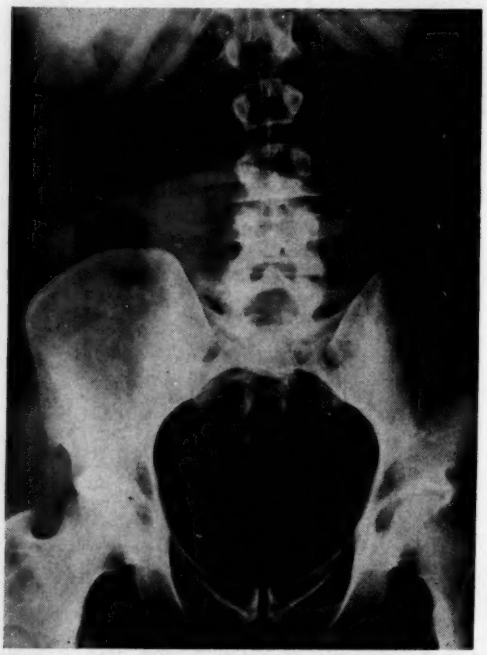

Fig. 4 (Case 4).—Huge radiolucent mass. No, this is not lipoma; it represents proved (surgical) case of neurofibromatosis.

not fixed, in about 90 per cent of all cases there are but five lumbar vertebrae.

The lumbodorsal fascia is basically the posterior aponeurosis of the transversus abdominis muscle. According to Cunningham's *Anatomy*, the lumbar fascia is that portion of the lumbodorsal fascia which binds down the deep muscles of the back to the sides and spines of the vertebrae. Above, it is continuous with the thoracic portion of the fascia and attached to the last and lowest ribs; medially, it is attached to the tips of the transverse processes and the spinous processes and the fronts of the transverse processes. Laterally, it is connected with the transversus abdominis muscles and the internal oblique muscles, while inferiorly it is attached to the posterior part of the external lip of the iliac crest, the spines of the sacrum and the posterior surfaces of the sacrum and coccyx.

Anatomically the lumbar region extends from the lowest ribs above to the pelvis below. Errors of development are responsible for congenital deformities, and these usually involve several systems.

The vertebral column is a sinuous and flexible column formed by a series of bones, the vertebrae. The lumbar vertebrae are the largest segments of the movable portion of the vertebral column. The lumbar vertebrae do not possess transverse process foramens as do the cervical segments of the column, nor do they have facets at the sides of their bodies as do the thoracic vertebrae.

A typical lumbar vertebra consists of two essential parts, the body, or anterior segment, and the arch, or posterior segment. There is a pronounced difference between the internal architecture of the body as contrasted to that of the arch; one is composed of cancellous bone, the other of compact bone.[2b] The posterior segment or arch is made up of a pair of pedicles and a pair of laminae that shield the neural canal posteriorly. It supports seven processes, viz: four articular (two superior and two inferior), two transverse and one spinous. The lumbar vertebral body is wider from side to side than from front to back and is thicker in the front

than in the back. This contributes to the lumbar lordosis. The body is also slightly concave above and below and concave behind, being deeply constricted in front and at the sides.

The fifth lumbar vertebra has a body more nearly wedge shaped than are the other lumbar vertebrae, being decidedly deeper in front than behind, with a smaller hatchet-shaped spinous process and thicker transverse processes. These transverse processes spring from the body as well as from the pedicles.

The arch of the fifth lumbar segment is subject to many defects. A common defect is separation of the neural arch. This causes considerable weakness, because no bony anchorage is provided for the vertebral column to the sacrum. With bifid development of the neural arch, support for the ligamentous structures is impaired.

The lowest lumbar vertebra is the end link of a flexible chain that acts as an absorber for the shocks transmitted by and through the entire spine.

The joints concerned in the articulation of each lumbar vertebra consist of the paired apophysial, both superior and inferior, and the intervertebral fibrocartilaginous disc. The apophysial joints are of the diarthrodial variety; the fibrocartilaginous disc is of the amphiarthrodial type. Because the superior articular facets are not in too close apposition with the inferior articular facets of the subadjacent vertebra, a considerable amount of lateral flexion is possible.

In the freely movable joints, such as the apophysial, the surfaces are completely separated and the bones entering into the formation of these articulations are expanded for greater convenience of mutual connection, covered with cartilage and invested with fibrous tissue. The cells that line the interior of the fibrous capsule about the joints form an imperfect membrane, the synovia, which secretes a lubricating fluid. Slight movement combined with great strength is present at the disc joints. In addition, the joints are strengthened by strong fibrous bands called ligaments, which extend between the bones that enter into the formation of these joints.

The motions of the lumbar portion of the spine that are executed through coordinated neuromuscular activity are flexion, extension, lateral flexion and rotation. Flexion is produced by the muscles of

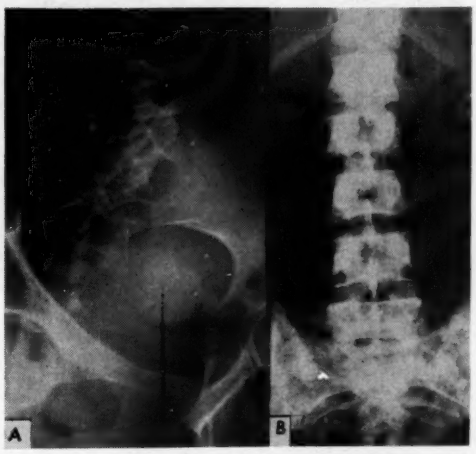

Fig. 5.—*A* (Case 5), Mrs. L. A. Low back pain for years, all types of treatment and examination. Example of gynecologic backache. Proved solid ovarian fibroma. *B* (Case 6), Mrs. H. Metastatic malignant tumor of breast.

Fig. 6 (Case 7).—Renal calculus in male patient (urologic backache).

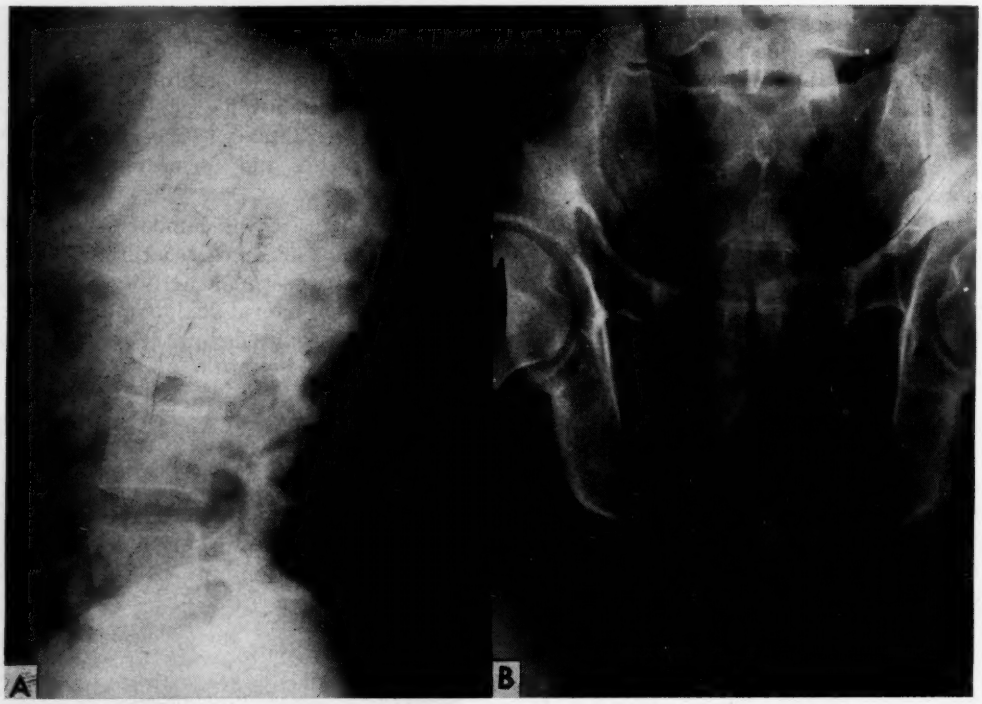

Fig. 7.—*A* (Case 8), trauma fracture of first lumbar vertebra. Note alteration, with distortion of shapes of adjacent intervertebral foramens. *B* (Case 9), ache and pain in hip region and lower part of back of male patient. Note sacralization of the lowest lumbar transverse process on one side (congenital) and sclerosis of inferior portion of contralateral sacroiliac articulation (mechanical).

the abdominal wall and the iliopsoas muscle. Extension, by the intrinsic muscles of the back and the multifidus; lateral flexion, by the intrinsic muscles of the back plus the quadratus lumborum and the iliopsoas, one side only acting, and rotation is produced by the action of the abdominal wall muscles and the multifidus, only one side acting.

The muscles involved in these movements extend beyond the lumbar region. For this reason alone, the roentgen study should include areas contiguous to the lumbar portion of the spine.

Full, complete and properly made roentgen studies of the lumbar portion of the spine can determine the presence of (1) fracture; (2) dislocation or subluxation; (3) anomaly; (4) infection; (5) degeneration; (6) necrosis; (7) neoplasm; (8) alterations in position and curvature; (9) the status of the paired and unpaired joints; (10) the status of the intervertebral foramens or the intervertebral notch; (11) congenital abnormality; (12) soft tissue involvement, and (13) osseous mineralization and/or texture.

The roentgenogram can be used to detect functional as well as structural alteration. The diagnostic roentgenologist can aid significantly in the proper assessment of the disease-producing factors operative in this area, but he must be prepared to utilize suitable technics. The initial survey studies should include the entire area of the body from the dorsolumbar juncture

to the plane of the lesser trochanters. These *routine* studies should consist of *erect* views with the patient in the anatomic position for the anteroposterior projection, with the arms elevated to shoulder height for the lateral projections, whether they are in neutral, flexion or extension, and an angled Ferguson study in the anteroposterior projection for the detection of sacroiliac abnormalities. Obviously, not all patients can undergo an examination in the erect position, but those who can be so examined should be. Additional views may be required.

Trauma may produce changes that are roentgenographically latent for varying periods. Follow-up roentgen studies are always indicated, because pressure absorption and erosion of the injured intervertebral structures may take place later.[2b]

Fig. 8 (Case 10).—Lumbar scoliosis, congenital and developmental; asymetric pelvis; sacralization of lowest lumbar transverse process (one side); isthmus defect (pars articularis) of other side.

Fig. 9 (Case 11).—Laminectomized female patient; reinjury. Disease of discs indicated by calcification.

Primary joint involvement may occur as the result of trauma and this trauma may affect several areas of the spine at one time and may accompany head injuries. Arthritis due to varying causes, rheumatoid and osteoarthritis may be demonstrable. Subluxations are not common in

the lumbar region because the plane of the apophysial joints is generally vertical as contrasted to horizontal in the cervical region.

Secondary joint involvement may occur as with infection from a neighboring structure, tuberculosis of bone or after alteration in the intervertebral disc. These discs are avascular and too inert to be attacked directly by infections and neoplasms and alteration here is usually directly or indirectly produced by trauma.[2a]

Dislocations of the lumbar spine do occur without accompanying fractures. The most common locus is at the lumbosacral joint, less commonly at the articulation between the fourth and fifth segments of the lumbar spine. In most instances, this common dislocation is primarily an anomaly of congenital origin but the actual displacement is usually due to additional superimposed trauma. Posterior congenital subluxations are uncommon.

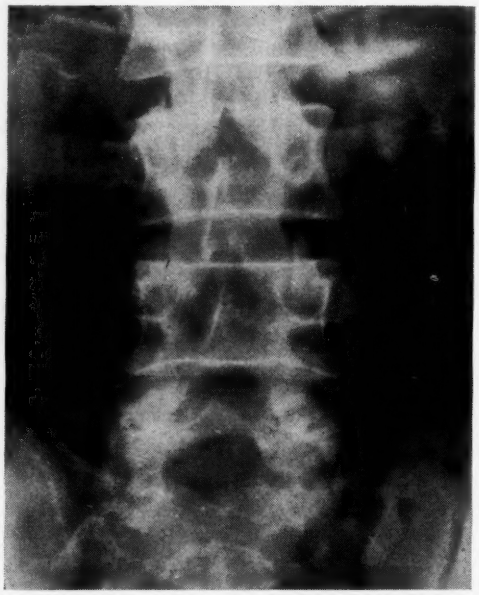

Fig. 11 (Case 13).—Q. B. Previous disc procedure (fifth lumbar, first sacral). Constant pain with radiation to left leg; altered reflexes; no definite atrophy. Note, in addition to operative defect, localized scoliosis (fourth and fifth lumbar level). Degenerated disc was found at this level.

Fig. 10 (Case 12).—Disc degenerative disease in male patient, manifested by (1) subchondral sclerosis, (2) diminished height of disc space and (3) the vacuum or phantom nucleus pulposus.

A tissue that is very difficult to examine is the intervertebral disc.[2c] These discs vary in size, shape and thickness in different positions of the spinal column and according to Gray's *Anatomy* constitute about one-fourth the length of the vertebral column exclusive of the first two vertebrae. The cervical and lumbar portions of the spine have in proportion to their length a much greater amount of disc substance than does the thoracic region with the result that both these portions of the spine possess great flexibility and freedom of movement.

The size and exact location of the nucleus pulposus which is the remnant of the primitive notochord varies in different parts of the spinal column. Compara-

tively, its size is greatest in the cervical and lumbar regions and less in the thoracic. As a rule in the cervical and lumbar regions it is situated at the juncture of the middle and posterior thirds of the body while in the dorsal region it is located more anteriorly. Schmorl's node formation is due to the protrusion of the nucleus pulposus into the spongiosa of a neighboring vertebral body.

The intervertebral disc occupies the clear non-radiopaque space between the vertebral bodies. Certain uncommon lesions render these discs radiopaque. To circumvent radiologic difficulties in the diagnosis of intervertebral disc syndromes both myelography and discography have been and are employed. These procedures are not without danger and risk and it is justifiable to do without them, if one can, for the obvious reason stated in the injunction to the physician, *primum non nocere*, above all do no harm.

The disc cartilage consists essentially of three structures: the nucleus pulposus, the annulus fibrosus and the cartilage plates of the adjacent vertebrae. Not to be overlooked is the fact that the nucleus pulposus is under constant pressure because of its own special consistency in a semi-elastic casing, the annulus fibrosus, and that it possesses the properties of a spring, at any rate elasticity, and that it manifests the movements of a ball and socket joint. Elsewhere, I have dwelt upon the use of simple methods in the diagnosis of the intervertebral disc syndrome.[2d]

The spinal nerves emerge through the

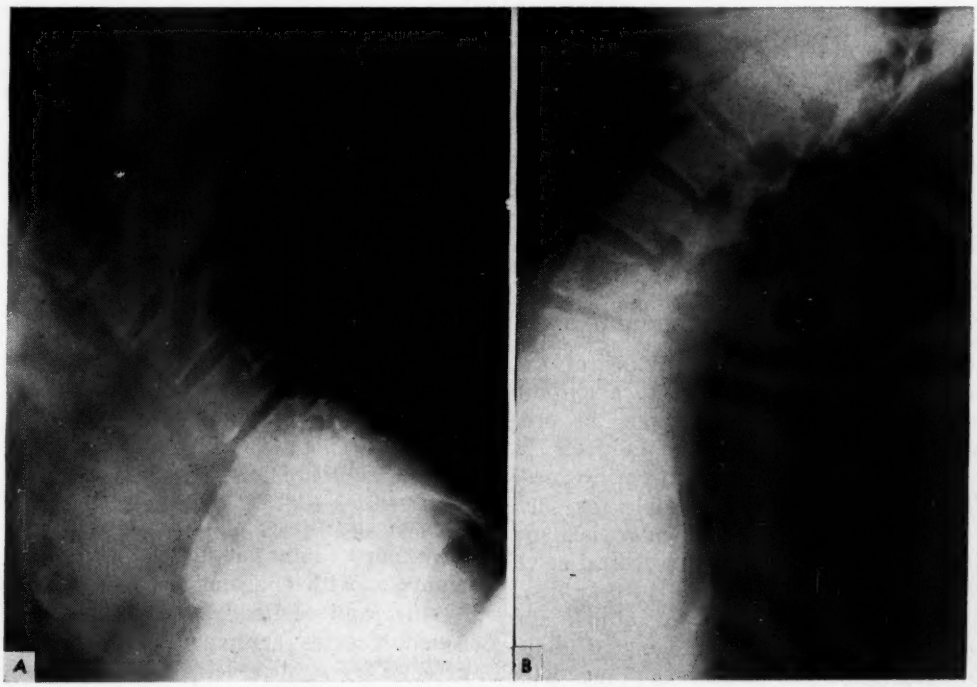

Fig. 12 (Case 14).—G. S. Residual pain and difficulty after disc procedure. Flexion and extension studies demonstrate instability of lumbar portion of spine at fourth and fifth lumbar level. Incidentally, this maneuver (extension) produces distribution of pain and aching complained of by patient (orthopedic and neurologic backache).

Fig. 13 (Case 15).—Inconstant so-called tri-sacral sprain in male patient; degenerating disc. Knuttson maneuver demonstrates a "vacuum."

intervertebral foramens to which they are bound. In the lumbar region as in the cervical these foramens diminish in vertical height from above downward while the nerves become thicker. As a result of this anatomic fact, "sciatic hook" formation or posterior osteophyte formation is very important! Furthermore, not infrequently as the result of a pathologic process and/or a physiologic one such as aging, there is a shortening of the vertebral column so that wrinkling of the nerves is produced leading to a chronic condition of irritation that may be progressive with compression and fibrosis. In addition, the loss of disc material, regardless of the process responsible for such loss, makes the ligaments more lax and loose and narrows the intervertebral notch so that pressure is brought to bear upon the emergent nerves. This loss of disc substance leads also to the placing of undue stresses upon the apophysial joints with alteration here and forces the spinal muscles to perform more work in order to maintain the stability and customary postural attitude of the spinal column. As a result, muscle spasm is common.

In the lumbar region the spinal nerves correspond in name and number to the five vertebrae. Each divides into an anterior and posterior ramus. The anterior rami of the upper four form the lumbar plexus. A portion of the fourth lumbar nerve joins the fifth to form the lumbosacral trunk. This nerve is frequently referred to as N. furcalis because of this division. The lumbar plexus also receives a communication from the last thoracic nerve. The distribution of the single nerve roots in this region has been worked out by J. J. Keegan,[3] whose writings and diagrams should be consulted.

Sherrington, the Nobel laureate, has shown that the fibers of touch, temperature and pain cross in close relation to the central canal of the cord in either the anterior or the posterior commissure. This crossing is increasingly oblique as one proceeds cranialward, and Sherrington's formula explains why a unilateral pathologic condition manifests itself by pain, the psychic equivalent of a protective reflex, to the patient not only on one side and at one level but on the contralateral side and at a different level. The "central integrator," or brain, is not always able, however, to discriminate between the sides of the body involved or to determine the extent of involvement. It is most difficult to be one own's physician. Socrates' "Know thyself" can hardly be attained.

The sympathetic trunk runs down on the bodies of the vertebrae at the medial edge of the psoas major muscle. It may have four to eight ganglia, and these communicate with the lumbar spinal nerves by the rami communicantes. These rami communicantes accompany each lumbar artery. The lumbar veins are also closely related to the arteries. Batson has demonstrated the connections of these vessels to the deep vessels of the pelvis and thus

accounted for the metastatic spread of neoplasms and infections to many distant areas. Involvement of the sympathetic nervous system in this area, as in injuries to the vertebrae, may produce visceral symptoms ranging from constipation to ileus, etc.

A full discussion of the physical examination is out of place here except to note that the diagnostic roentgenologist should discourage spinal studies based solely upon the localization of pain and tenderness as demonstrated by the local physical examination. The patient's symptoms require more analysis than this alone.

What should be borne constantly in mind is that alteration of the usual physiologic curves of the back is responsible in large part for the patient's pain. The strains and stresses on the spine are greatest at the apices of the curves of the vertebral column. Improper lifting, off-balance lifting and poor posture contribute to scoliosis and improper lordosis, and these factors lead to changes in the spinal curves. Such changes and alterations of curvature can be evaluated reontgenographically and only if the patient is examined in anatomic positions, i.e., erect and in attitudes of flexion and extension. The study of structure alone is not sufficient, and all cases that can be studied in these positions and postures should be studied in this manner. The roentgenogram that physicians need is the one that gives the best representation of nature. The study of structure alone is not sufficient and roentgenographic exploration of any region should be designed to secure the maximum amount of information that can be obtained.

SUMMARY

The methods employed by the roentgenologist permit him to explore, detect and study the *pathologic conditions in the living*. Full utilization of roentgen data can be secured only on the basis of fundamental embryologic, physiologic, neurologic, anatomic and pathologic knowledge of the region studied. A review of the lumbar region, touching upon these aspects, is presented. A plea is made for the greater use of simple roentgen examination in diagnosis of the intervertebral disc syndrome. The importance of full and properly secured roentgen ray studies is stressed, since they are necessary to obtain maximum information. The roentgenogram can furnish objective evidence of physiologic as well as morphologic change.

RIASSUNTO

Con i metodi radiologici e' possibile esplorare, svelare e studiare le varie condizioni patologiche nel vivente. L'interpretazione corretta dei dati radiologici, tuttavia, e' possibile soltant mediante una perfetta conoscenza della embriologia, fisiologia, neurologia, anatomia e patologia della regione studiata. Viene presentata, sotto questi vari aspetti, la regione lombare e viene auspicato un piu' diffuso impiego del semplice esame radiologico per la diagnosi della sindrome da disco intervertebrale. Viene, inoltre, sottolineata l'importanza di uno studio radiologico completo ed accurato, indispensabile per ottenere tutte le informazioni necessarie sulle modificazioni fisiologiche e patologiche della regione esaminata.

RESUMEN

El radiólogo tiene a su alcance la exploración y el diagnóstico de muchas enfermedades del ser vivo, pero para sacar el mayor partido posible de su especialidad, necesita conocer 10 mejor posible la anatomía, embriología, fisiología, neurología y anatomía patológica de la región a explorar. Se repasan estas disciplinas en lo que se refiere a la región lumbar, y se insiste en la importancia de haver un examen

radiológico sencillo en los casos sospechosos de lesión del disco intervertebral.

También se señala el interés de hacer estudios radiológicos lo más completo posibles cuando así lo requiera el diagnóstico. Las radiografías pueden demostrar alteraciones tanto fisiológicas como morfológicas.

RÉSUMÉ

Les méthodes radiologiques permettent au spécialiste d'explorer, de déceler et d'étudier les états pathologiques sur l'être vivant. Une pleine utilisation des données radiologiques n'est possible que sur la base d'une connaissance fondamentale des conditions embryologiques, physiologiques, neurologiques, anatomiques et pathologiques de la région étudiée. Une revue de la région lombaire ayant trait à ces différents aspects est présentée. L'attention est attirée sur la nécessité d'une utilisation plus large de l'examen radiologique pour le diagnostic du syndrome du disque intervertébral. L'auteur insiste aussi sur l'importance d'examens radiologiques complets et correctement exécutés, indispensables pour l'obtention d'un maximum d'informations. Les radiogrammes peuvent apporter une évidence objective des modifications physiologiques aussi bien que morphologiques.

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*Additional relevant material will be found in Sir Arthur Keith's *Human Embryology and Morphology;* Gray's *Anatomy;* Cunningham's *Manual of Practical Anatomy,* and Samson Wright's *Physiology.*

Those who belong to a herd are in general unable to understand the wish of others to escape from it. Such a wish is an implied criticism upon the herd conception, and brings a sense of insecurity. Thus the desire for leisure and solitude, or for a life amid wild surroundings, is regarded with instinctive disapproval. . . . Something of the same feeling is entertained by the average man towards the artist or the writer. He distrusts the contempt of herd standards which his irregular life implies.

—*Joad*

Aspiration Biopsy for Detection of Carcinoma of the Breast: A Critique

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MIAMI, FLORIDA

THE attitude toward aspiration biopsy varies from absolute rejection to enthusiastic application of the procedure.[1] Why should there be such a wide range of attitudes toward this particular method of study? After all, surgeons deal with identical types of patients, with similar breasts and basically similar lesions.

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Submitted for publication April 4, 1961.

The use of needle aspiration biopsy as a means of diagnosing carcinoma of the breast is examined on the basis of the author's experience and that of others. There are many well-founded objections to this procedure. These the author lists and discusses in some detail, concluding that such a test, even in trained hands, may give a falsely negative, indecisive or equivocal result at a time when accuracy is all-important. Three cases are summarized in illustration of his argument.

Only when one stops to evaluate existing variations in surgical technical skill, differences in pathologic experience and the complexities of histologic patterns of mammary disease can one begin to understand why such a diversity of attitudes exists. Let us first ask and then answer certain pertinent questions concerning the validity and necessity of aspiration biopsy in lesions of the breast:

1. Is a biopsy specimen obtained by needle aspiration representative of the lesion?
2. What is to be gained in time by resorting to needle-aspiration biopsy?
3. What advantages does a needle-aspiration biopsy offer the patient from the standpoint of:
   (A) comfort, convenience and cost;
   (B) morbidity (i.e.) hemorrhage and infection, and (C) psychic trauma?
4. If needle-aspiration biopsy aids in earlier diagnosis, has it then contributed to attaining a higher five-year survival rate in the hands of those who routinely employ it?
5. What is the reaction of the surgeon who receives an equivocal, inconclusive or negative report?

6. What is the meaning of "benign" as applied to a specimen obtained by needle-aspiration biopsy?
7. What are the advantages and disadvantages of routine needle-aspiration biopsy?

1. *Is the Needle-Aspiration Biopsy Specimen Representative of a Lesion of the Breast?*—Much depends on the size and mobility of the lesion and on whether it is superficial or deeply recessed in the fibrous-fatty substance of the breast. The size of the breast, the skill of the operating surgeon and the experience of the pathologist are also important factors, but they are extremely variable. Small solid tumors of the breast can easily be bypassed, and aspirated material may be inadvertently obtained from an adjacent cyst. Although superficial tumors are not difficult to aspirate, deep-seated lesions do offer certain obstacles. Even at operation, under good light and with direct vision and palpation, it is no simple matter to isolate a small mass. Certainly a needle embedded deep in the substance of the breast, without benefit of direct vision, with the course and direction of the needle based solely on indirect palpation, carries with it the risk of completely missing the lesion. From the moment the needle point passes below the epidermis, the surgeon is relying more upon divine guidance than upon his own capabilities. Needle-aspiration biopsy differs significantly from excisional biopsy because it is essentially a blind procedure; the surgeon must hope that he hits his target—he cannot by the farthest stretch of his imagination be positive; and herein lies the ever-present danger of error. Otto Saphir at one time did favor needle-aspiration biopsy of mammary lesions,[2] but today he openly and completely rejects it as redundant. Haagensen and Stout[3] have stated, "In cystic disease of the breast associated with tumor, the tumor may be so small as to be missed by needle aspiration"; also, that "small carcinomas may be overlooked."

Performing an excisional biopsy in which the entire suspected mass is removed for study is the best way to avoid the following potential errors in pathologic interpretation:

1. The comedo type of carcinoma is recognized by its topographic character rather than by its individual cells, which are quite regular (Haagensen[3]).

2. Some "atypical" lesions of cystic mastitis can be easily misdiagnosed on gross examination during operation unless biopsy is performed immediately.

3. A diffuse tumor-like inflammatory mass may exhibit suggestive cells on aspiration biopsy (plasma cell mastitis and ruptured galactocele).

4. The point of a needle may fail to enter the tumor; if it does enter the mass, no aspirate may be obtained. If material is successfully aspirated, it may or may not be representative of the lesion.

5. Not infrequently, cells considered questionably malignant or atypical are present in material aspirated from a benign tumor of the breast; examples are ductal hyperplasia and papillary cystadenoma. Usually the final determination of the presence of malignancy in a papillary cystadenoma depends upon multiple carefully selected sections. Well-differentiated tumor cells are not always confined to the ducts, and the small cell type of carcinoma with single cells embedded in a dense fibrous matrix is not easily recognized on aspiration biopsy.

6. In a personal communication, Otto Saphir,[4] pathologist at Michael Reese Hospital in Chicago, stated: "From my experience a needle-aspiration biopsy of a breast cyst is not indicated. It is only extremely rare that a cyst disappears and hence it would have to be removed anyway, regardless of what the aspirated

fluid shows. Besides what appears as a cyst may be an edematous fibroadenoma. I am in perfect agreement with you that a mastectomy should not be performed on the basis of findings in the fluid of a few malignant looking epithelial cells."

7. Hans Popper,[5] pathologist at the Mount Sinai Hospital of New York, in a personal communication stated: "If cyst material is available it should by all means be examined—but that a final decision be postponed until surgical biopsy confirms the diagnosis."

II. *What Is to Be Gained in Time by Needle-Aspiration Biopsy of the Breast?* —Will a needle biopsy really save time, or does it lead to needless and possibly harmful delay? Hans Popper has stated: "In my opinion—almost every examination based on cytology should be considered to give tentative results—to be confirmed, if at all possible, by a definitive method. I do not doubt the tremendous advantage of cytology but quite often deviation from the principle outlined above led to unpleasant complications. I therefore would feel that if cyst material becomes easily available, it should by all means be examined, but that a final diagnosis be postponed until surgical biopsy confirms the diagnosis. This obviously makes the needle biopsy redundant."

It is here apparent that needle-aspiration biopsy actually results in delay, with an unnecessary loss of time, and that radical mastectomy is best postponed until an excisional biopsy can be performed and a definitive pathologic diagnosis established.

Victor Calderin, chief pathologist at the St. Francis Hospital in Miami Beach, in a personal communication, stated: "this biopsy [needle-aspiration] is of value only in large palpable advanced carcinomas."

Those who advocate needle-aspiration biopsy for the diagnosis and treatment of mammary cysts readily admit the recurrence of cystic fluid after a second, a third and even a fourth aspiration. Patients who do not require reaspiration must still be periodically observed for recurrence and possible malignant change. Cysts that refill after two aspirations are usually removed surgically; cysts revealing blood or blood-tinged secretion are routinely subjected to operation. It is interesting to note that, when a mass recurs several months after needle aspiration, one can no longer be sure what is happening in the breast; one must consider the possibility that the cyst has refilled or that a new mass has formed. When intracystic hemorrhage develops as a result of needle-point trauma during the initial aspiration, and reaspiration becomes necessary, the withdrawal of bloody fluid results only in further equivocation, indecisiveness and delay. The answer to the question, "What is gained in time by needle-aspiration biopsy of the breast?" must be "Time is not gained—it is *lost!*" Delay in diagnosis and deferment of definitive treatment remain the outstanding factors in preventing further improvement of current statistics on five-year survival.

III. *What Advantages Does Needle-Aspiration Biopsy Offer the Patient from the Standpoint of* (1) cure, cost and convenience; (2) morbidity (a) hemorrhage, (b) infection and (c) pain and discomfort; and (3) psychic trauma (fear, anxiety and carcinophobia)?

No patient should be made comfortable with a false sense of serenity secured only by the report of a benign lesion on the basis of needle-aspiration biopsy. To collapse a cystic mass in the breast by removing its fluid and then assure the patient against the presence of carcinoma is like administering morphine for an intractable tuberculous cough and assuring the patient that the disease is now under control. Picture, if you can, a woman visiting her doctor for a lump in the breast;

he aspirates a cyst, which promptly disappears; the patient returns a month later with a new or recurrent lump in her breast. Can you imagine telling a woman who is already depressed and distressed that it is now necessary for the tumor to be removed surgically? This sequence of events involves loss of time, extra cost and possible irremediable psychic trauma to the patient. As regards the loss of one or two months, let me reiterate that it should be the goal of every physician to discover premalignant or malignant lesions of the breast as early as possible. The interval between discovery of the lump and the patient being seen by the doctor should remain under three months —and preferably only one. Shimkin and his associates,[6] in 1952, commented that if patients delayed only one month or less before coming in for treatment, a five-year survival rate of 60 per cent could be attained. This 60 per cent refers to an overall percentage, which would mean a 20 per cent increase over current statistics and a 40 per cent increase over the existing 20 per cent of five-year survivals with untreated carcinoma of the breast. Darland,[7] of the Massachusetts General Hospital in Boston, stated that in the first three months the percentage of carcinomas of the breast without axillary involvement is at its highest. After three months there is an ever-increasing rise in the incidence of axillary involvement. A clean-cut surgical biopsy, promptly and correctly performed, entails less psychic trauma to the patient, no inconvenience to the surgeon and ultimately less cost to the patient; most important of all, the loss of one or two critical months, in the event that classic radical mastectomy was indicated, is eliminated.

Several serious and unfortunate complications may follow needle-aspiration biopsy. Intramammary hemorrhage may result from the puncture of dilated vessels surrounding a breast lesion. It is quite common for a needle point to traumatize a cyst wall and produce intracystic hemorrhage. When the cyst refills (with or without blood) it usually becomes firmer and presents a new problem, compounded by additional ambiguity and indecisiveness. It is then that surgical biopsy offers the only safe and logical solution. Infection is not an uncommon complication resulting from needle insertion and probing of the breast; the abscesses that develop require incision and drainage. The chronic draining sinuses that ensue usually have to be excised.

Paul B. Szanto,[8] director of the Department of Pathology of the Cook County Hospital and County Institutions, in a personal communication, effectively summed up the question of "cost-convenience-and cure" by stating: "Aspiration biopsy of cystic lesions of the breast is a diagnostic method without any value. It is a waste of time, money and effort. It does not replace excisional biopsy for the final evaluation of the case . . . In our opinion, the excisional biopsy cannot be replaced by other methods for the exact evaluation of the nature of the palpable tumors of the breast."

IV. *Where Are the Advantages in Cost, Time, Comfort and Morbidity of Needle-Aspiration Biopsy?*—A study was made at Memorial Hospital in New York City[9] of 1,406 women who had undergone radical mastectomies for primary operable carcinoma of the breast. Four groups were established:

Group I: Patients with obvious carcinoma of the breast (surgeon decided not to obtain a biopsy specimen)

Group II: Patients suspected of having carcinoma of the breast (needle-aspiration biopsy performed)

Group III: Patients with suspect benign lesions which, after surgical biopsy, revealed carcinoma

Group IV: Patients who had undergone various diagnostic procedures before mastectomy (incisional, excisional, aspiration, slides from other hospitals, and cell block preparations).

Nine hundred and thirty-four cases representing the first three groups were studied.

Group II: 543 had needle-aspiration biopsy (133 required a combination of aspiration and surgical biopsy)

Group III: 258 had local excisional biopsies.

The writers stated: "Needle-aspiration biopsies were done on cases that clinically looked like carcinoma, whereas local excision was performed on cases that clinically appeared benign."

Of the 543 cases in Group II in which needle-aspiration biopsy was performed, 133 (24 per cent) required an additional surgical biopsy. One of very 4 aspiration biopsies had to be finally substantiated by excisional surgical biopsy; 24 per cent of negative or inconclusive results in the experienced hands of the foremost proponents of needle-aspiration biopsy makes this procedure, in my opinion, unreliable and not to be recommended for general acceptance. Imagine, if you can, what anxieties and apprehensions this group of women must have suffered from the multiple explorations, multiple preparations, multiple reports to be awaited in fear, unnecessary loss of time and then —at long last—radical resection of the breast!

v. *If Needle-Aspiration Biopsy Aids in Earlier Diagnosis, Has It Then Contributed to the Attainment of a Higher Five-Year Survival Rate?*—In a paper from Memorial Hospital in New York City, by Robbins, Brother, Eberhart and Quan, entitled "Is Aspiration Biopsy of Breast Cancer Dangerous To The Patient?",[9] two of these authors' conclusions are germane to this question: (1) aspiration biopsy is not dangerous to the patient,

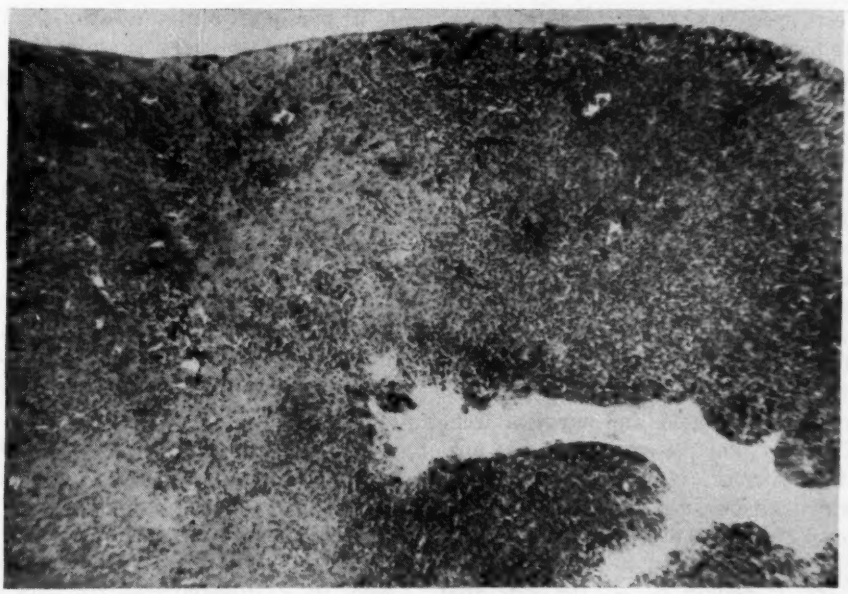

Fig. 1 *(Case 1)*.—Sinus tract surrounded by wide zone of suppurative inflammation showing focal abscess formation.

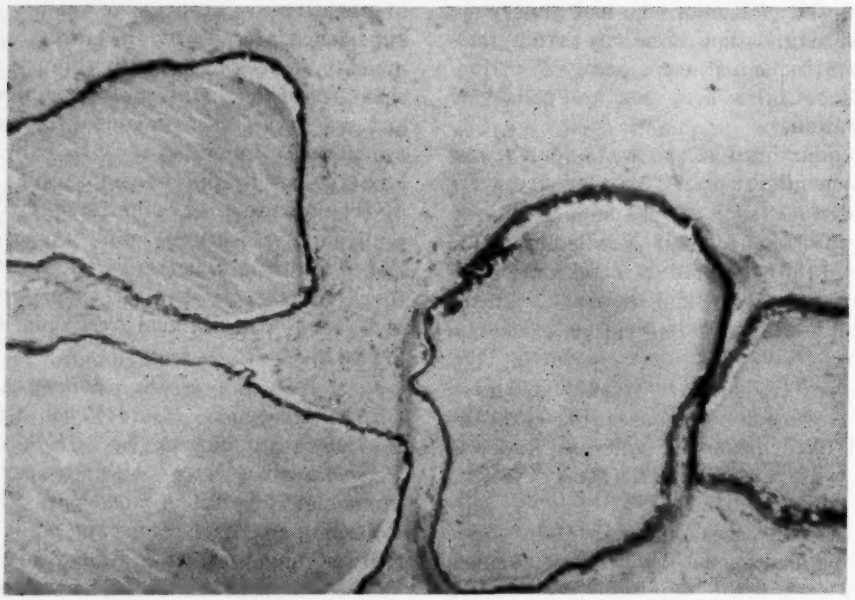

Fig. 2 *(Case 2).*—Multiple cysts of breast. Note transitional zone of "heaped-up" cells, representing area of early malignant change.

and (2) needle-aspiration biopsy has had no effect upon long-term survival rates in their patients with cancer of the breast.

VI. *What is the Reaction of the Surgeon Who Receives an Equivocal, Inconclusive or Negative Biopsy Report?*—The surgeon, being completely responsible for his patient at all times, cannot afford any errors either of omission or commission. The correctness of his judgment and work is constantly exposed to critical evaluation. In other words, the surgeon, both for the patient's sake and for his own, can ill afford to err. He must therefore strive to reduce to the minimum his percentage of errors in judgment and surgical technic. The only way he can attain his goal is to be informed, fact-conscious, critical in his evaluation and conclusions, logical and level-headed. As a routine habit, he must move slowly and think fast! If he must err, it should be on the side that benefits his patient. This question is best summed up by Hans Popper[5], who stated in a personal communication: "In my opinion, almost every examination based on cytology should be considered to give tentative results, to be confirmed, if at all possible, by a definitive method . . . that a final decision be postponed until surgical biopsy confirms the diagnosis. This obviously makes, as you say, needle biopsy redundant, and that is what I am telling my surgical friends." The reaction of the surgeon who receives such a report is usually that of confused annoyance; he must wait, therefore, until the pathologist carefully examines the biopsy specimen and submits a final report.

VII. *What Is the Meaning of a Benign Report on a Specimen Obtained by Needle Aspiration?*—Goodwin[10] and other proponents of needle aspiration caution:

"A few atypical epithelial cells may be seen in cystosarcoma—phyllodes, papilloma, and sclerosing adenosis."

"When the diagnosis of carcinoma is made, there should be no doubt that the diagnosis is correct. To compromise will lead to mastectomy for a benign lesion. Any radical mastectomy for a benign lesion is too many for any series."

"Papillary carcinoma may superficially suggest papilloma."

"One should be cautious in diagnosing carcinoma in the presence of inflammatory material, since atypical benign cells may be encountered."

"One must be constantly aware that aspirates of cysts rarely contain malignant cells (benign, epithelial and red blood cells) ; malignant cells are usually derived from cysts whose walls have undergone hyperplastic or malignant changes, or from adjacent cysts with (intracystic) papilloma or carcinoma."

"The surgeon should not remove a breast without being certain of his diagnosis. On those occasions where a frozen section may not reveal the diagnosis (i.e.) inflammation, proliferative changes, and well differentiated carcinomas such as well differentiated intraductal papillary carcinoma, it is best to remain conservative. The surgeon should elect to close the biopsy wound, return the patient to her room, and patiently await the report of the paraffin section. One or two days at the most may be lost. The surgeon who proceeds with mastectomy because he intuitively feels it is not safe to wait for a definitive diagnosis uses faulty judgment, and opens himself to severe and serious criticism. A delay of one or two days will not impair the patient's chance for attaining the best possible result."

Brief summaries of 3 illustrative cases are here appended:

REPORT OF CASES

CASE 1.—Mrs. E. G., aged 39, had been under the care of a physician who diagnosed

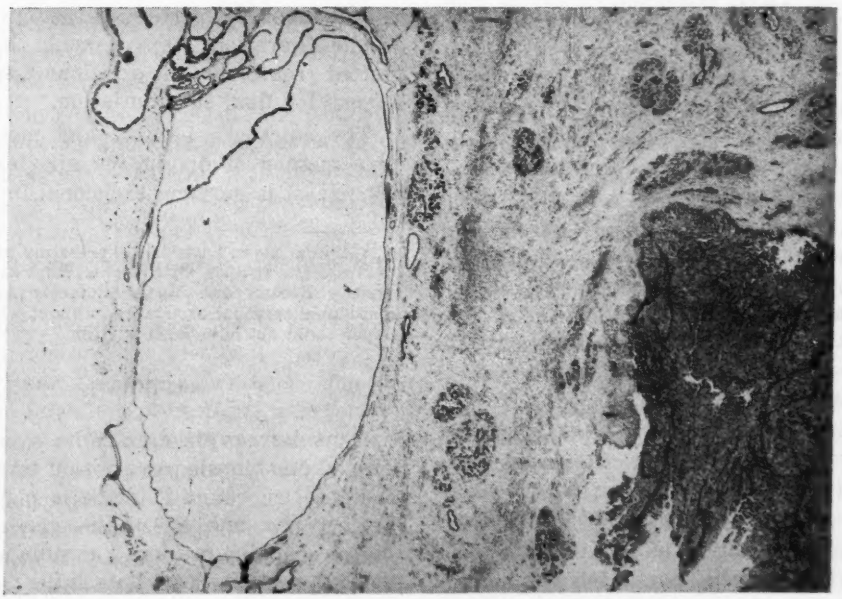

Fig. 3 *(Case 3)*.—Low power view of cyst adjacent to malignant tumor of breast.

a suspect cyst in the right breast and promptly aspirated it. The aspirate was reported as normal. The treated cyst became infected, requiring incision and drainage. When I saw the patient, several months later, the right breast revealed a chronic draining sinus tract that had resisted healing since the original incision and drainage. Wide excision of the involved portion of the breast was performed, and recovery was uneventful.

CASE 2.—Mrs. M. B., aged 48, complained of "lumpiness" in the breast. Her physician aspirated the suspected cyst. The cytologic report was normal. After one month the cystic swelling recurred. An excisional biopsy was performed, and the pathologic diagnosis was premalignant changes within the walls of the cyst. Simple mastectomy was performed.

CASE 3.—Mrs. N. D., aged 51, had a large cyst of the right breast, which was repeatedly aspirated. After the second recurrence an excisional biopsy was done, and the pathologic diagnosis was carcinoma adjacent to the wall of the cyst. A classic radical mastectomy was performed.

SUMMARY

In cases of advanced carcinoma of the breast in which excisional biopsy is contraindicated or the patient's physical condition obviates general anesthesia, needle-aspiration biopsy serves two useful purposes: (a) it establishes a diagnosis prior to radiotherapy, and (b) it benefits the hospital record.

Its disadvantages are as follows:

A needle-aspiration biopsy specimen of the breast may not be representative of the lesion.

Small and early carcinomas of the breast can easily be bypassed and aspirated material from an adjacent cyst inadvertently obtained.

Needle aspiration is a blind procedure and even in trained hands may give a negative, indecisive, or equivocal result in about 1 out of 4 cases (24 per cent).

Needle-aspiration biopsy is not an aid to early diagnosis, nor has it contributed to a higher five-year survival rate.

Needle-aspiration biopsy does not save time; actually it may lead to unnecessary delay and loss of time.

The morbidity rate is increased by needle-aspiration biopsy; hemorrhage, inflammation, abscess formation and chronic draining sinuses are not infrequent complications, and subsequent surgical intervention is required in all instances.

The patient is often made uncomfortable, kept in a state of false serenity, forced to spend more money, and exposed to infinitely greater psychic trauma.

The surgeon must proceed on a definitive diagnosis—not on a tentative one. Because the surgeon can ill afford to err (e.g., to perform a radical resection of the breast for a benign lesion, to delay operation for a missed carcinoma too long), he must avail himself only of foolproof methods and technics.

A surgical biopsy of all suspected lesions of the breast offers the surgeon a routine procedure that is as close as possible to 100 per cent accuracy and safety.

All lesions reported as benign after needle-aspiration biopsy should be submitted routinely to excisional surgical biopsy for final substantiation.

The quickest, cheapest and most reliable method of diagnosing any lesion of the breast is surgical excisional biopsy.

Author's Note: I wish to express my gratitude to Drs. Hans Popper, Otto Saphir, Paul B. Szanto, Jerome Benson and Victor Calderin for their invaluable personal assistance, without which this paper could not have been written.

RÉSUMÉ

Dans les cas de carcinome avancé du sein où une biopsie par excision est contre-indiquée, ou quand l'état de la malade ne permet pas une anesthésie générale, la biopsie par aspiration à l'aiguille à prélèvement remplit deux buts utiles: a) elle permet un diagnostic antérieur aux ex-

amens radiologiques; b) elle améliore les statistiques hospitalières. Mais ses inconvénients sont les suivants:

1. Un spécimen de biopsie du sein par aspiration à l'aiquille à prélèvement peut ne pas être représentatif de la lésion.

2. Les petits carcinomes précoces du sein peuvent facilement échapper à l'aiguille et le matériel aspiré peut provenir, par inadvertance, d'un kyste adjacent.

3. C'est un procédé aveugle qui, même entre des mains entraînées, peut donner des résultats négatifs, indécis ou équivoques dans 1 cas sur quatre (25%).

4. Cette technique n'apporte rien au diagnostic précoce; elle n'a pas non plus contribué à augmenter la moyenne de survie de 5 ans.

5. Elle ne fait pas gagner de temps, pouvant même entraîner un retard et une perte de temps évitables.

6. Elle augmente le taux de morbidité: hémorragies, inflammations, formation d'abcès et drainage chronique des sinus, sont des complications assez fréquentes, et une intervention chirurgicale ultérieure est toujours nécessaire.

7. Il en résulte que la malade peut être maintenue dans un état de fausse sérénité, elle est obligée à des frais plus importants, et exposée à un traumatisme psychique infiniment plus grave par la suite.

8. Le chirurgien doit se baser sur un diagnostic précis et non sur un diagnostic hypothétique. Du fait que le chirurgien ne peut guère se permettre d'erreur, consistant par exemple à pratiquer une résection totale du sein pour une tumeur bénigne, ou à retarder trop longtemps l'opération d'un carcinome ayant échappé au diagnostic, il ne doit se baser que sur des méthodes techniques à toute épreuve. La biopsie chirurgicale de toute lésion suspecte du sein offre au chirurgien une technique de routine qui se rapproche le plus possible de la précision et de la sécurité absolue.

9. Toutes les lésions diagnostiquées comme bénignes après une biopsie à l'aiguille de prélèvement devraient être soumises à une biopsie chirurgicale de routine afin d'obtenir une preuve définitive.

10. La méthode de diagnostic la plus rapide, la moins onéreuse et la plus sûre de toute lésion du sein, est la biopsie chirurgicale excisionnelle.

RIASSUNTO

Nel cancro avanzato della mammella in cui la biopsia chirurgica e' controindicata o le condizioni della malata impediscano l'anestesia generale, si puo' ricorrere alla biopsia per puntura, che ha due vantaggi: (a) puo' chiarire la diagnosi per la radioterapia, e (b) consente di classificare il caso. Essa, tuttavia, ha anche i seguenti svantaggi:

1. Il frammento di tessuto aspirato con l'ago dalla mammella puo' non essere indicativo.

2. Nei cancri iniziali e di piccole dimensioni l'ago puo' passare oltre la lesione e aspirare materiale da una cisti adiacente.

3. L'aspirazione per puntura e' un procedimento cieco che puo' dare risultati negativi, incerti o equivoci anche in mani esperte nel 24% dei cai.

4. L'aspirazione di materiale per biopsia non porta nessun contributo alla diagnosi precoce del cancro e non contribuisce a migliorare le quote di sopravvicenza a distanza di 5 anni.

5. Essa non fa risparmiare tempo, anzi puo' portare a un ritardo nelle decisioni.

6. Aumenta la quota di morbilita' a causa di emorragie, flogosi, formazione di ascessi e di fistole, che poi rendono necessario l'intervento.

7. La malata spesso ne viene disturbata, mantenuta in uno stato di fallace serenita',

costretta a spendere di piu' e poi esposta ad un trauma psichico di gran lunga maggiore.

8. Il chirurgo deve fare una diagnosi esatta e non soltanto un tentativo di diagnosi. Esso e' soggetto a sbagliare sia nel senso di asportare radicalmente una mammella per una lesione benigna che di ritardare troppo l'intervento per non aver riconosciuto in tempo un cancro, e pertanto deve servirsi solo di metodi e tecniche che presentino una sufficiente sicurezza. La biopsia chirurgica nelle lesioni sospette della mammella e' ancora il metodo piu' sicuro, quello che offre quasi il 100% di garanzia.

9. Tutte le volte che la biopsia per puntura e' stata negativa, bisogna poi fare anche la biopsia chirurgica per avere la sicurezza.

10. La biopsia chirurgica, in conclusione, e' il metodo piu' rapido, economico e sicuro per diagnosticare qualunque lesione della mammella.

ZUSAMMENFASSUNG

In Fällen von vorgeschrittenem Brustkrebs, bei denen eine Probeexzision kontraindiziert ist oder der Körperzustand der Patientin keine Allgemeinnarkose gestattet, fallen der Ansaugungspunktion mittels einer Kanüle zwei nützliche Aufgaben zu: a) eine Diagnose vor Einleitung der Strahlenbehandlung zu stellen und b) die Krankengeschichte zu vervollständigen. Die Nachteile des Verfahrens sind die folgenden:

1. Das durch Nadelaspiration aus der Brust gewonnene Präparat mag kein typisches Bild der Erkrankung abgeben.

2. Kleine und frühzeitige Brustkrebse können leicht von der Nadel verfehlt werden, und statt dessen mag Material von einer in der Nähe gelegenen Zyste zufällig abgesaugt werden.

3. Die Nadelabsaugung ist ein blindes Verfahren und kann selbst in der Hand des Geübten in 25 Prozent der Fälle zu negativen, unentschiedenen oder umstrittenen Ergebnissen führen.

4. Die Probeabsaugung mit der Kanüle verhilft nicht zur Frühdiagnose und hat keinen Beitrag zur Erhöhung der Überlebensquote nach fünf Jahren geführt.

5. Die Probeabsaugung mit der Nadel bedeutet keine Zeitersparnis, sie mag in der Tat zu unnötigen Verzögerungen und Zeitverlusten führen.

6. Die Morbiditätsquote erhöht sich durch Anwendung der Probeabsaugung. Blutungen, Entzündungen, Abszessbildungen und lange drainierende Fisteln sind keine seltenen Komplikationen und erfordern in allen Fällen chirurgisches Eingreifen.

7. Die Patientin wird häufig Unbequemlichkeiten ausgesetzt, wird in einen falschen Zustand des Gefühls der Sicherheit versetzt, ist gezwungen, mehr Geld auszugeben und wird einem erheblich grösseren psychischen Trauma exponiert.

8. Die Pläne des Chirurgen müssen auf einer festen Diagnose und nicht auf einer Vermutungsdiagnose aufgebaut sein. Der Chirurg kann sich nicht gut einen Irrtum leisten, d.h. eine radikale Brustresektion beim Vorliegen einer gutartigen Erkrankung ausführen noch die Operation für ein unerkanntes Karzinom zu lange aufschieben. Daher darf er sich nur bedingungslos sicherer Methoden und Techniken bedienen. In der chirurgischen Probeexzision bei allen verdächtigen Brusterkrankungen hat er ein routinemässiges Verfahren, dass fast hundertprozentig genau und sicher ist.

9. Alle Erkrankungen, die auf Grund der Absaugungsprobe als gutartig berichtet wurden, müssen zur endgültigen Klärung routinemässig mit chirurgischer Probeexzision nachuntersucht werden.

10. Das schnellste, billigste und zuverlässigste diagnostische Verfahren bei al-

len Brustdrüsenerkrankungen ist die chirurgische Probeexzision.

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In surgery, water has ever been considered of great utility; it, no doubt, was instinctively used by man to cleanse and heal his wounds. Patroclus, having extracted the dart from his friend Eurypylus, washes the wound; and the prophet Elisha prescribes to Naaman the waters of Jordan. Rivers had various qualities, and were supposed to prove as different in their action on the economy as the mineral springs which from time immemorial, have been resorted to. These effects may in fact not be altogether doubtful; for, although these salutary streams may not possess sufficient active ingredients to be recognised by chemical tests, yet we know that substances which appear perfectly inert may prove highly active and effectual when combined and diluted naturally or artificially. Moreover, in the effects of watering-places on the invalid or valetudinarian, we must not forget the powerful influence of change of air and habit, the invigorating stimulus of hope, and the diversion from former occupations. To these auxiliaries many a remedy has owed its high reputation; and probably when Wesley attributed his recovery to brimstone and supplication, he in a great measure might have considered rest from incessant labour the chief agent in his relief.

—*Millingen* (circa 1837)

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Hyperthecosis and Polycystic Ovaries Associated with Excessive Uterine Bleeding

WARREN M. JACOBS, M.D., F.A.C.S.

AND

JAMES A. FRIEDMAN, M.D.

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Twelve cases in which the ovaries presented the gross and microscopic features of the Stein-Leventhal ovary are presented. In all cases the primary complaint was of excessive bleeding, and in only 1 were there even minimal signs of defeminization. The possible relation between this clinical picture and the classic Stein-Leventhal syndrome is discussed.

IN 1935, Stein and Leventhal described a syndrome characterized by secondary amenorrhea, sterility, hirsutism, acne and bilateral polycystic disease of the ovary. The microscopic features of the latter are hyperplasia of the theca interna cells which frequently show evidence of luteinization, absence of corpora lutea or corpus luteum cysts, and the presence of innumerable follicle cysts. Many theories have been advocated to explain the pathogenesis of this syndrome as well as to explain why wedge resection of the ovaries is the treatment of choice. At present, evidence points to excessive lutumizing hormone as the causative factor. The role of the follicle-stimulating hormone is not clear, although it is probably low in most cases.

Although mention has been made of excessive bleeding being an occasional feature of this syndrome, not too much attention has been devoted to this type of clinical feature.

Our attention was called to this entity in 1956, when a vaginal hysterectomy was performed on a 24-year-old Negress para 0-0-0-0, because of profuse and persistent uterine bleeding which failed to respond to the usual medical regimens and repeated curettage. When the ovaries were inspected following the hysterectomy, they grossly resembled those of the Stein-Leventhal syndrome. Wedge biopsy was done and histologic verification obtained. Because of this patient's rather marked obesity, the enlarged ovaries were not palpable before the operation nor at the times of the many previous curettements. Because of this case, we began to look for similar signs in young women with persistent bleeding that failed to respond to the usual methods of treatment. It has been our policy for the past several years to inspect the ovaries of such patients by culdoscopic study, colpotomy or laparotomy after all usual therapy has failed to control the bleeding.

Materials and Methods.—This report consists of pertinent data on 12 patients, including the initial patient who under-

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Submitted for publication April 28, 1961.

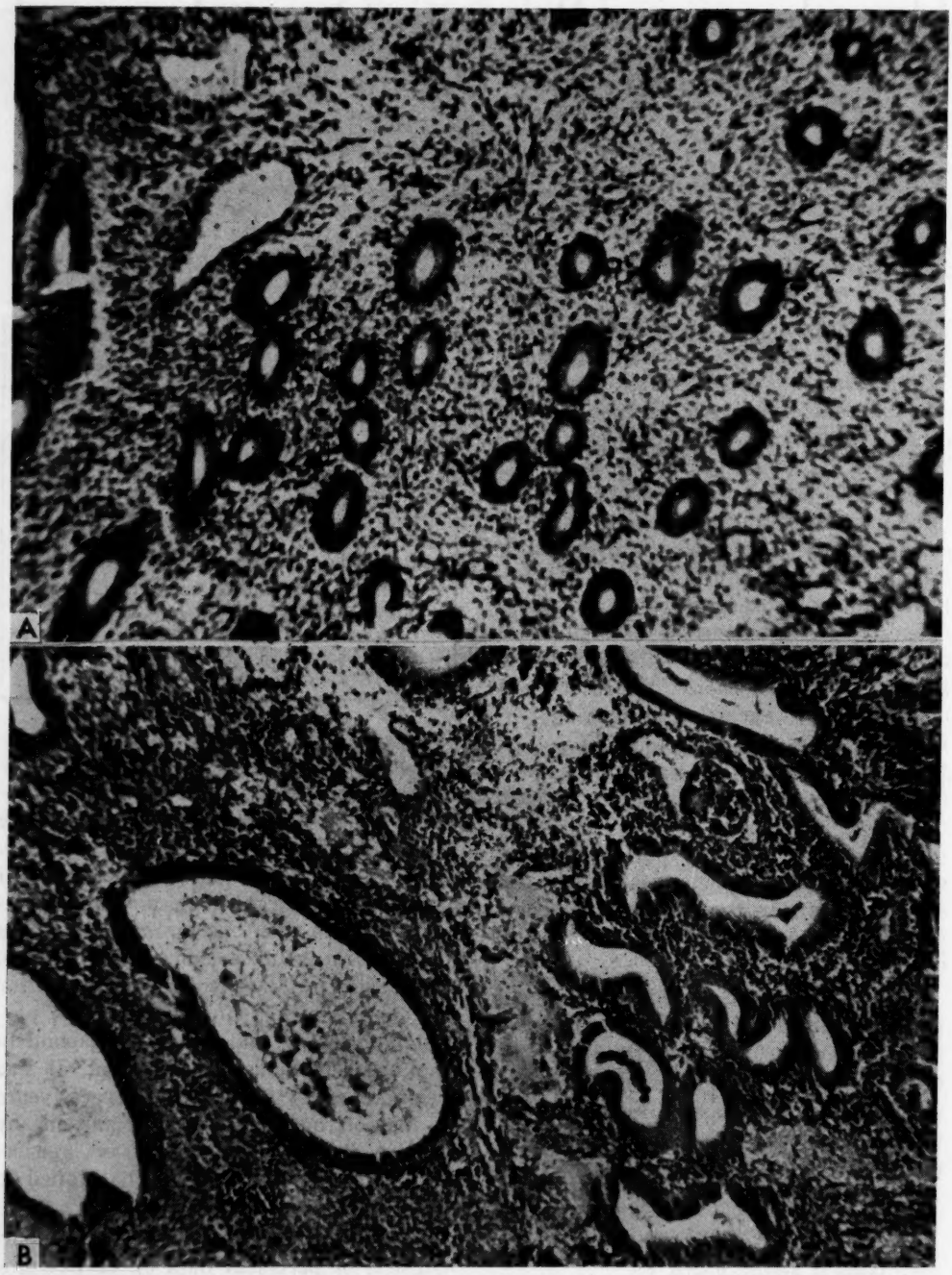

Fig. 1.—*A*, preoperative endometrial biopsy specimen demonstrating early proliferative endometrium. *B*, preoperative endometrial biopsy demonstrating benign endometrial hyperplasia.

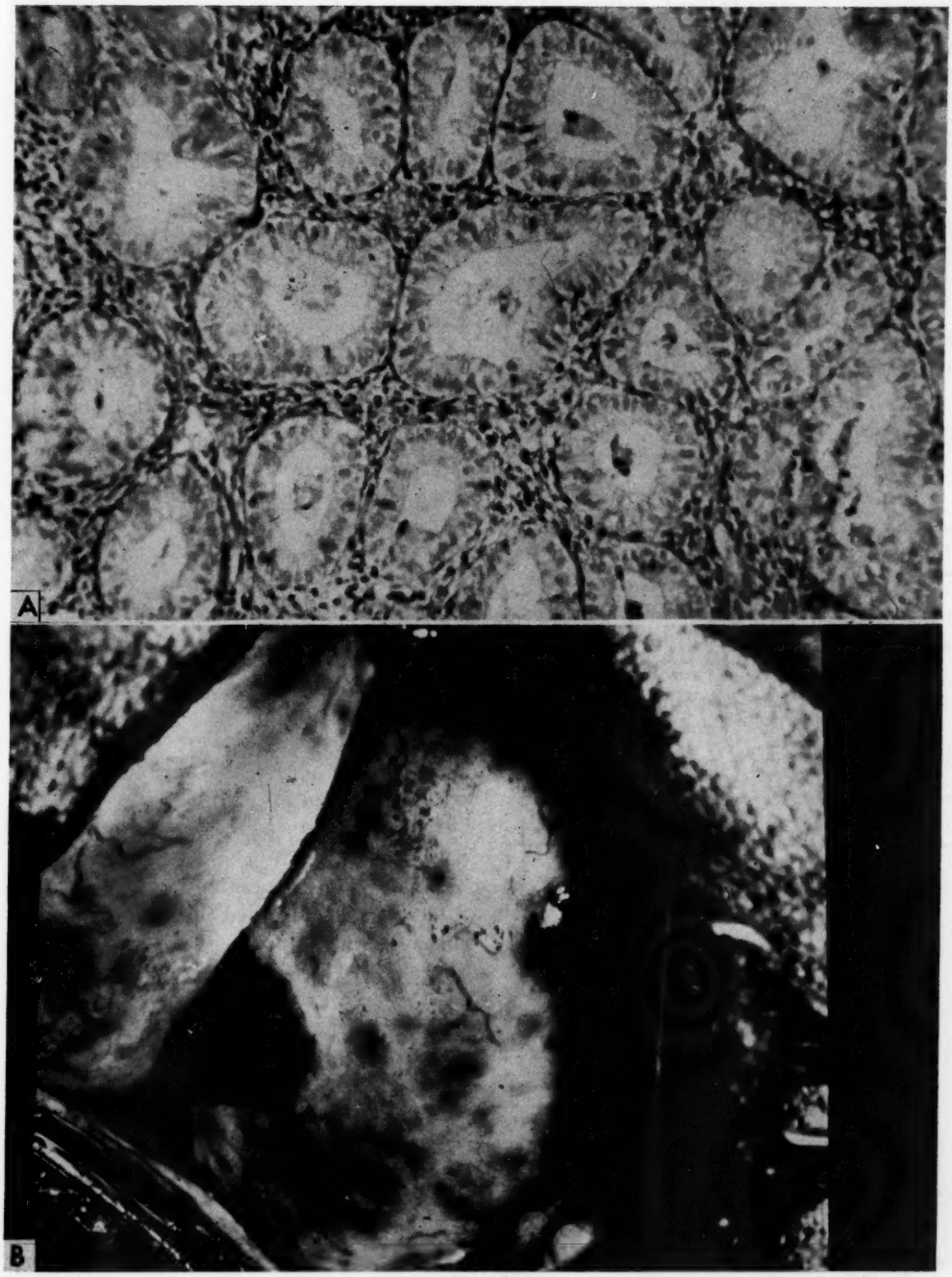

Fig. 2.—*A*, marked atypical endometrial hyperplasia prior to wedge resection. *B*, enlarged billateral polycystic ovaries *in situ*. Arrow demonstrated small uterus in lower center portion of photomicrograph. Patient given injection of FSH prior to laparotomy.

went vaginal hysterectomy. All were clinic patients seen in the Endocrine Clinic of Jefferson Davis Hospital of Houston, Texas, the teaching hospital of Baylor University College of Medicine.

Color: All of these patients were colored, the significance of which is unknown. Interestingly enough, all of Stein's patients were Caucasian.

Age and Parity: The youngest patient was 15 and the oldest 32, with a median age of 20.7. None had been pregnant.

Primary Complaint: In all instances the primary complaint was of excessive bleeding. The duration varied from two months to thirteen years, the latter occurring in the oldest patient in the group, who had had irregular and excessive bleeding since her menarche, which began at the age of 18. One patient had intermittent bouts of hypermenorrhea and amenorrhea, as well as some acne and hirsutism, but no other signs of virilization were detectable.

Physical Signs: Two patients had moderate hypertension, which was probably coincidental. The ovaries were thought to be enlarged bilaterally in five cases and unilaterally in four. As stated, one presented acne and mild hirsutism; only one presented any degree of obesity.

Laboratory Data: Eleven patients were anemic, the initial hemoglobin reading being under 12 Gm. The lowest was 3.9 Gm. Thyroid function as determined by protein-bound iodine was low in only 1 patient. 17-ketosteroid and 17-hydroxycortocoid excretion per twenty-four hours were within normal limits in all. Since available follicle-stimulating hormone determinations were done on 4 patients and found to be in the low to normal range. Luteinizing hormone determinations are still experimental.

Treatment Prior to Wedge Resection: Multiple forms of therapy directed toward control of the bleeding were tried in all cases. These included the use of estrogen, progesterone, androgen, sedation and empiric thyroid, as well as repeated curettage and correction of anemia. All patients were subjected to a battery of therapeutic procedures before undergoing wedge resection.

Endometrial Picture: The endometrial picture varied from proliferation to hyperplasia. In only 1 case was there adenomatous hyperplasia.

Operative and Postoperative Observations: All patients demonstrated bilaterally enlarged ovaries grossly resembling those associated with the Stein-Leventhal

TABLE.—1. *Data on Fifty-Four Negro Patients*

Age: youngest 15, oldest 32, median 20.7	
Parity: 0	
Age at Menarche:	11—2 patients
	12—5 patients
	13—4 patients
	18—1 patient
Duration of Symptoms: 2 mo.; longest, 13 yr.; average, 41 mo.	

TABLE 2.—*Pertinent Physical Signs*

Hypertension		2
Palpable ovaries		9
Unilateral	4	
Bilateral	5	
Obesity		1
Acne and mild hirsutism		1

TABLE 3.—*Laboratory Data*

Anemia (under 12 Gm.)	11 (lowest, 3.9 Gm.)
Thyroid function (PBI)	
Normal	11
Low	1
Adrenal Steroids (17-keto and 17-hydroxysteroids) all within normal limits	
FSH—4 determinations all low normal	

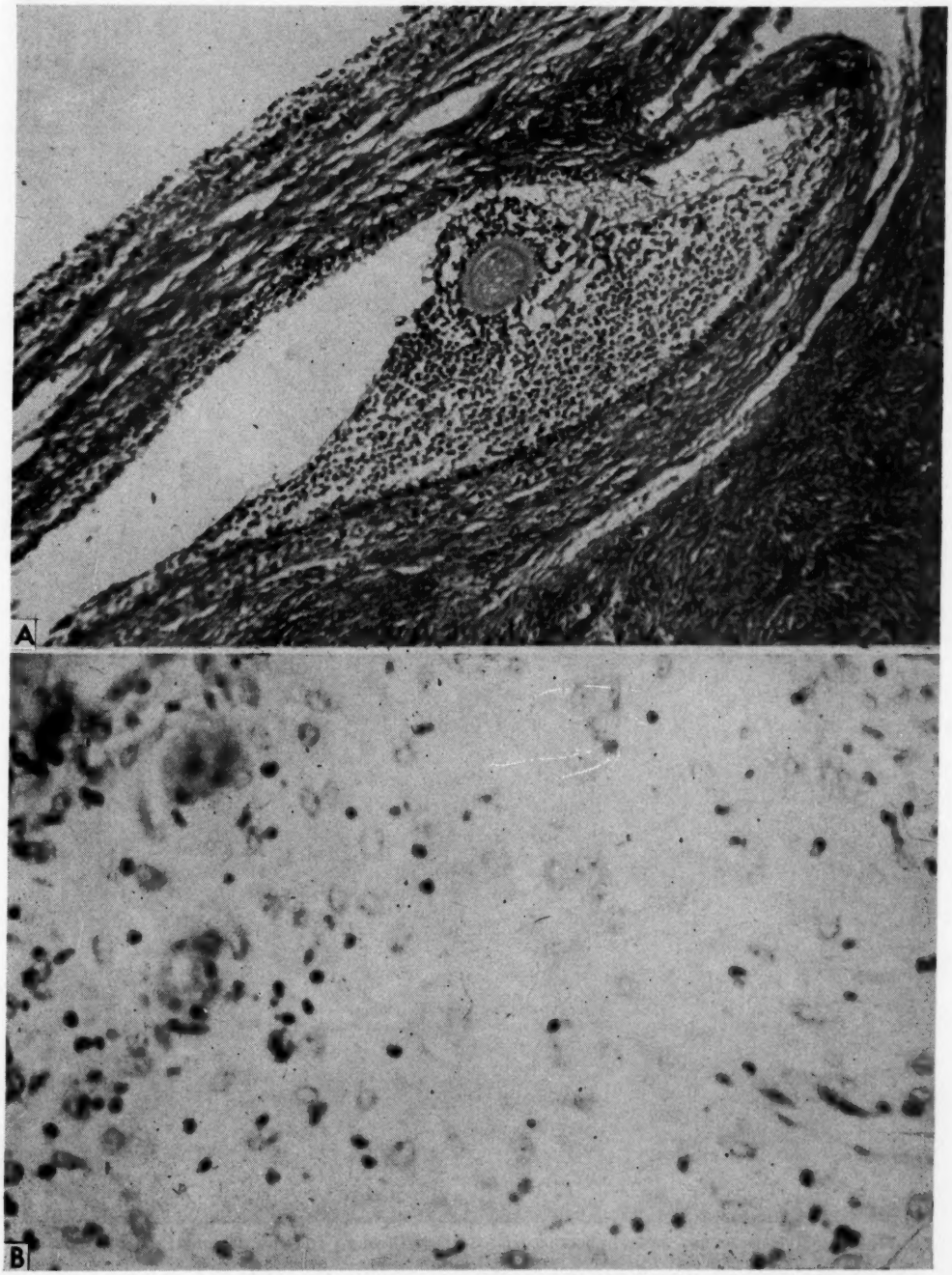

Fig. 3.—*A*, microscopic section of polycystic ovary. B, Masson stain showing thickened tunica characteristic of polycystic ovary with hyperthecosis (Masson's stain).

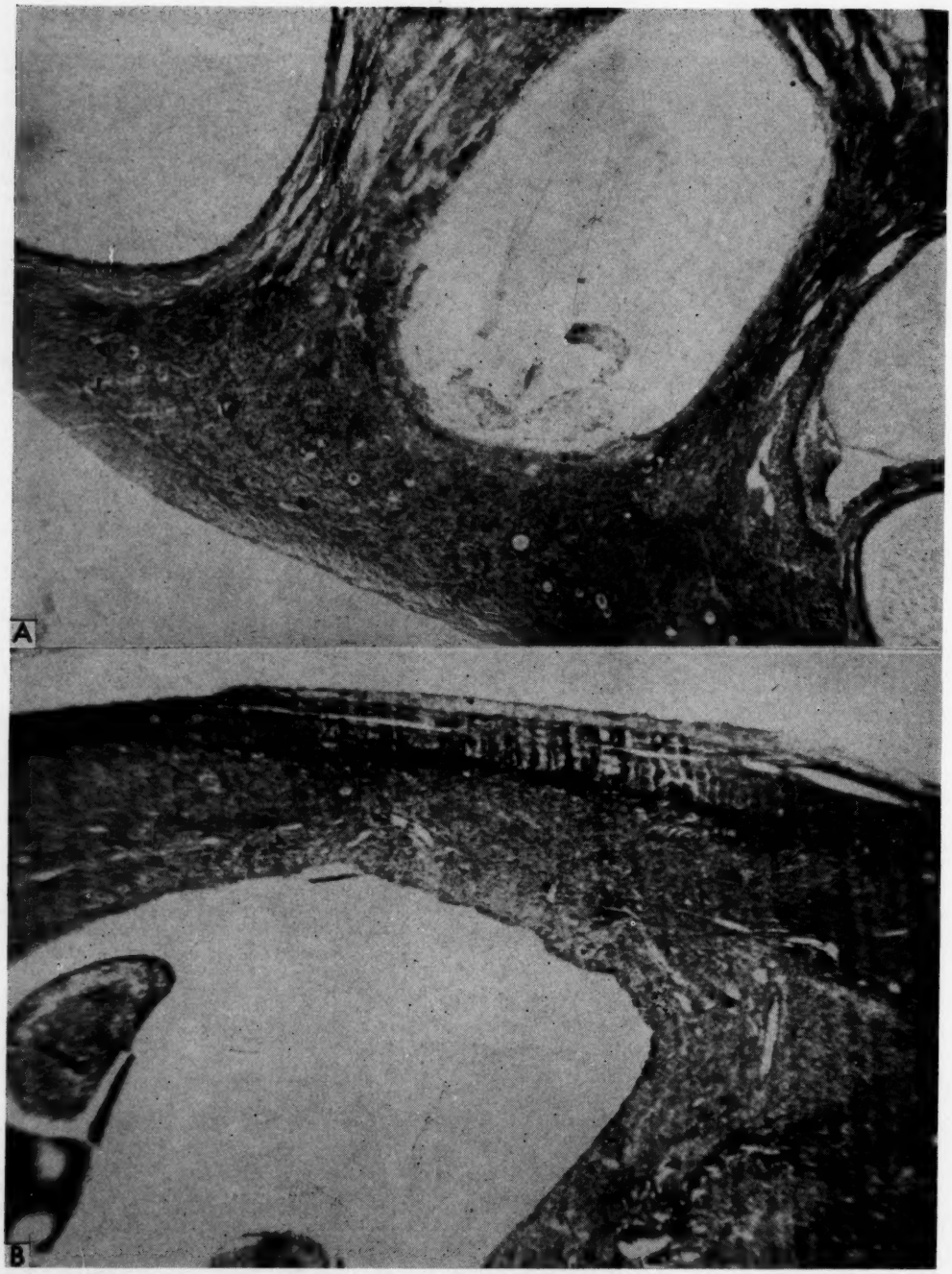

Fig. 4.—*A*, polycistic ovary with hyperthecosis. Section through follicle, demonstrating presence of ovum. Postoperative endometrial biopsy specimen obtained six hours after onset of menses, showing marked deciduoid reaction (same patient demonstrated atypical endometrial hyperplasia prior to wedge resection presented).

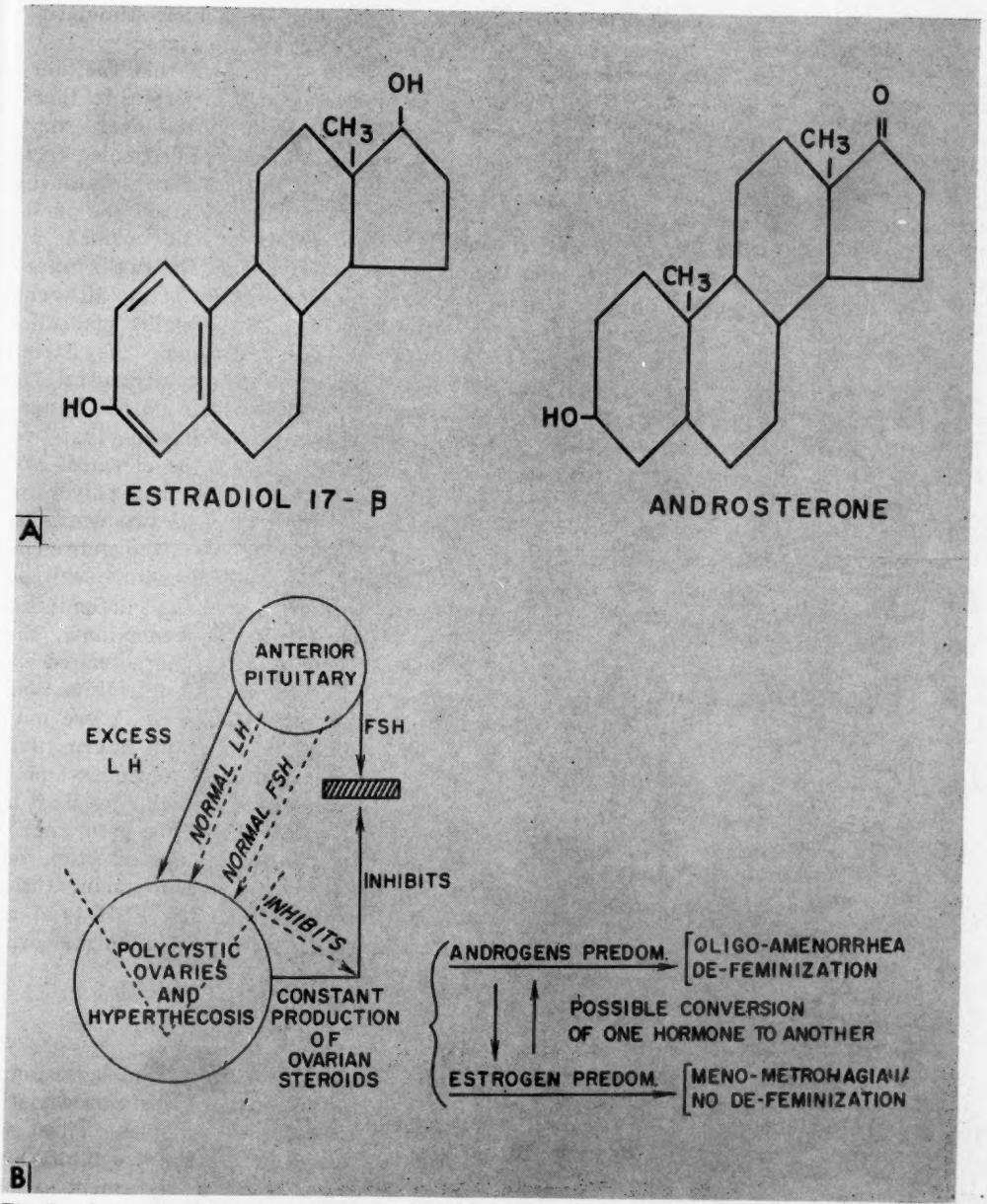

Fig. 5.—*A*, structural formulae of estradiol 17-beta and androsterone, showing close relation. *B*, diagrammatic scheme demonstrating manner in which polycystic ovaries with hyperthecosis can produce either menometrorhagia or oligoamenorrhea with defeminization.

syndrome, some larger than others. Microscopically, all fitted the criteria. An interesting phenomenon was encountered in 1 patient; a microscopic nest of cells,

subsequently interpreted as an estrogen-producing Sertoli's cell tumor, was discovered in one removed wedge. This suggests a possible relation between feminizing mesenchymomas and theca cell hyperplasia.

Results of Wedge Resection.—Eight patients returned almost immediately to normal cyclic bleeding in 5 instances associated with ovulation and in 3 with anovulatory menses. One patient underwent hysterectomy and 3 failed to respond. Two of the 3 last mentioned subsequently responded to cyclic progesterone therapy, whereas prior to wedge resection they had both been so treated without success. One responded to curettage, whereas prior to the wedge resection she had undergone curettage three times without success. The patient with adenomatous hyperplasia reverted to normal cyclic bleeding with ovulation. This has been described in a recent publication by Kaufman and others.

Pregnancy: There have been no known pregnancies in this series. We hope that a subsequent follow-up on the same group of patients will demonstrate some successful pregnancies.

Although the causes of the Stein-Leventhal syndrome are not clear, evidence points to increased luteinizing hormone and probably low follicle-stimulating hormone as the causative factors.

Recent work has shown that the steroids produced by the hyperplastic theca cells in the Stein-Leventhal ovary may have an estrogenic or an androgenic effect. Chemical analysis of ovarian substances by many investigators indicates the possibility of conversion of one hormone to another. If one considers the slight difference in chemical structure of the different ovarian steroids, this is highly plausible. Although in most cases of the Stein-Leventhal syndrome the total neutral 17-ketosteroids level is within normal range, the level of ovarian androgens that are not 17-ketosteroids may be elevated. We should like to postulate that polycystic ovaries with hyperthecosis produce both androgens and estrogens. If the androgens predominate, the clinical picture will be that of oligo-amenorrhea and defeminization. If the estrogens predominate, the clinical picture will be characterized by excessive bleeding without defeminization. Combinations may exist; i.e., there may be acne, some hirsutism and intermittent bouts of hypermenorrhea and oligo-amenorrhea. In either case the value for FSH is low, owing to inhibition by both androgens and estrogens. Wedge resection removes tissue that is overproducing these substances and allows the FSH level to rise to normal, setting off a normal ovarian cycle.

TABLE 4.—*Preoperative Endometrial Picture*

Proliferative	4
Cystic hyperplasia	7
Adenomatous hyperplasia	1

TABLE 5.—*Postoperative Results*

Normal cyclic bleeding		8
c Ovulation	5	
s Ovulation	3	
Failure to establish cyclic bleeding		3
Subsequently responded to progesterin	2	
Subsequently responded to curettage	1	
Hysterectomy		1

RÉSUMÉ

Les auteurs décrivent 12 malades dont les ovaires présentaient les caractéristiques macro- et microscopiques du test de Stein-Leventhal. Le premier symptôme a toujours consisté en un saignement excessif, et une malade a présenté des signes minimes de déféminisation. La relation possible de ce tableau clinique avec le syndrome typique de Stein-Leventhal est discutée.

RIASSUNTO

Vengono presentati 12 malate in cui le ovaie mostravano il quadro macroscopico e istologico della sindrome di Stein-Leventhal. Il sintomo principale, in tutti i casi, era l'emorragia e solo in una donna vi erano piccoli segni di mascolinizzazione. Vengono discussi i rapporti fra questa sindrome e quella tipica di Stein-Leventhal.

ZUSAMMENFASSUNG

Es wird über zwölf Patientinnen berichtet, bei denen makroskopisch und mikroskopisch die Merkmale des Stein-Leventhalschen Eierstockes nachgewiesen wurden. Die ursprüngliche Beschwerde aller dieser Patientinnen war übermässiges Bluten. Nur eine zeigte Zeichen von Entweiblichung, cnd auch diese in nur sehr geringem Grade. Die Möglichkeiten, das klinische Krankheitsbild zu erkennen und das typische Stein-Leventhalsche Syndrom werden erörtert.

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The most popular topics of conversation are weather and health. . . . Each has its appealing interest. But health and disease have certain dramatic angles not possessed by their rival topic, the weather. We can discuss the weather in great detail, but we can do little else than observe it. . . . The course of disease, on the other hand, can be profoundly influenced. No one has yet devised a method of preventing volcanic eruptions or of stopping hurricanes, but bubonic plague and yellow fever, which once swept entire continents and depopulated cities, have been practically banished from the earth. . . . Since the primitive peoples looked upon disease as a manifestation of divine wrath, it was only natural that those who tried to change these divine decrees were regarded as set apart from the rest in a special class.

—*Major*

Multiple Dermoid Cysts of the Ovary

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FOREST HILLS, NEW YORK

DERMOID cysts of the ovaries are at one and the same time exciting and mysterious tumors of the female reproductive system. When they are suspected, properly diagnosed and finally removed, the operating surgeon is much gratified. This is because the simple thrill of their removal inversely defies the relatively complex explanation of their existence to the patient and her relatives.

The existence of dermoid cysts of the ovaries has given rise to rather uniform percentages of unilaterality and bilaterality, each calculated to be about 11 per cent in a series of 1,007 compiled cases.[1] Nowhere, however, either in the older or the more recent literature, is the incidence given for multiplicity. As a matter of fact, a search of modern American literature fails to reveal a single reported case of multiple dermoid ovarian cysts. Only in the foreign and old literature is any mention made of this peculiarity.[2] Heinsius observed five dermoid plugs in one ovary.

From the Gynecological Service of the Brooklyn Women's Hospital.

Submitted for publication April 24, 1961.

An unusual case of multiple dermoid cysts of the ovaries is described, and the literature is reviewed.

Not a single similar case of this type was encountered in the modern American literature.

Normal ovarian tissue should be conserved.

Lynch and Maxwell[3] cited Novak's collection of 21 cases in 1909, in only 7 of which were the cysts bilateral. Novak added 2 cases of his own, 1 with 10 dermoids in the right ovary and 11 in the left. The other case was that of a 17-year-old girl who had 6 dermoids in the right ovary and 4 in the left, completely separated from each other. Bonney[2a] reported 3 cases of multiplicity; 2 patients had 3 dermoid cysts in one ovary and 2 in the other, while the third had 3 in each ovary. In 1945, Russel[4] reported a case of multiple bilateral ovarian dermoid cysts in which the patient had 2 dermoid cysts in the right ovary and 4 in the left.

Origin.—The origin of dermoid cysts of the ovaries, like that of teratomas in general, is not clear. Most observers favor the blastomere theory of Marchand-Bonnet, which postulates the origin of these tumors from blastomeres segregated at an early stage of embryonic development. The predilection of teratomas for the ovary is not explainable, nor is their multiplicity. As to the latter, bits of blastomeres probably lie isolated in the primitive ovary and later develop side by side to produce multiple dermoids.

At the Brooklyn Women's Hospital from Jan. 1, 1949, to Dec. 31, 1958, there were 625 cases of ovarian neoplasia. In 54 the lesions were dermoid cysts, an incidence of 11.6 per cent. In 45 the cysts were unilateral; in 22 cases they occurred in the right ovary, in 23 in the left. In 9 cases they were bilateral. No multiple dermoid cysts were encountered.

The case of 7 multiple dermoid ovarian

cysts here reported is unusual, in that it seems to be the first of its kind in recent American literature.

REPORT OF CASE

Mrs. J. G., 23, white woman married two and one-half years, known to me before her marriage but never examined premaritally, consulted me on Dec. 27, 1958. Her last menstrual period had occurred on November 12, and she complained of an enlarged abdomen. Staining had occurred on November 30 and December 26.

Menstruation had begun at the age of 11. The periods had occurred regularly every twenty-eight days and had lasted approximately five days. The patient was obese, weighing 177 pounds (80.3 Kg.). Her height was 5 feet (160.02 cm.). She was subject to minor allergies. Vaginal examination revealed a uterus of normal size. Tumor masses arising from both ovaries were palpated, and the entire abdominal enlargement was judged to equal that of a four months' gestation. An Ascheim-Zondek test on December 23 revealed no abnormality. The basal metabolic rate was plus 3.

A normal menstrual period occurred on Jan. 23, 1959, after which, on February 3, she was admitted to the hospital. A roentgenogram of the lower part of the abdomen revealed a pelvic mass containing calcifications suggestive of dermoid cysts.

The patient was subjected to a laparotomy on February 5, under general anesthesia. There was about 100 cc. of clear fluid in the abdominal cavity. Both ovaries were replaced by cystic masses, each side totaling 15 cm. in diameter. The uterus was normal in size. Each cyst was enucleated separately; 4 were removed from the right ovary and 3 from the left. Each cyst, when opened, contained the same elements characteristic of dermoids. Small portions of normal ovarian tissue were left bilaterally.

Pathologic Report.—The specimens consist of 7 ovoid cysts, the largest of which measured 9.5 by 9 by 8 cm. All were filled with lardaceous material and matted hair. The genital ridges contained skin and bony fragments, some of which resembled teeth. No histologic evidence of malignant neoplasia was observed.

The patient made an uneventful recovery and was discharged in good condition on February 11. She has been followed periodically since the operation. At the last examination, on Sept. 15, 1960, she was having regular periods and the pelvis was normal. She expressed a desire for pregnancy.

COMMENT

Multiple dermoid cysts of the ovaries occurring bilaterally in a young woman are exceedingly rare, being here reported for the first time in the American literature. Apparently complete fetal rudiments originating from isolated bits of blastomeres had grown and developed in the patient's ovaries from birth. This situation, in my opinion, is different from that associated with secondary dermoid cysts in the ovaries, which do not show typical embryonic rudiments. In addition, for true multiplicity to occur, each septum between the cysts must contain normal ovarian tissue. This was apparently the case with my patient. An important point, and one that bears reemphasis, is that normal ovarian tissue, when present in any amount after removal of pathologic ovarian tissue, should be preserved.

Author's Note: I wish to thank Dr. Aristoteles Christou, Resident in Gynecology at the Brooklyn Women's Hospital, for his help in the preparation of this article.

CONCLUSIONS

L'auteur décrit un cas rare de kystes dermoïdes multiples des ovaires et commente la littérature.

Il n'a pas rencontré un seul cas de ce genre dans la littérature américaine moderne.

Dans ces cas, le tissu ovarien physiologique devrait être conservé.

CONCLUSIONI

Viene descritto un caso insolito di cisti dermoidi multiple delle ovaie e passata in rassegna la letteratura su questo argomento. Nella letteratura americana moderna non esistono altri esempi del genere.

CONCLUSIONES

Se describe un caso poco frecuente de dermoide múltiple del ovario con una revisión de la literatura.

En la literatura americana moderna no se encuentra un solo caso como el expuesto.

El tejido ovárico normal debe ser conservado.

SCHLUSSFOLGERUNGEN

Es wird ein ungewöhnlicher Fall von multiplen Dermoidzysten der Eierstöcke beschrieben und ein Überblick über die einschlägige Literatur gegeben.

Im modernen amerikanischen Schrifttum konnte kein einziger ähnlicher Fall dieser Art gefunden werden.

Das normale Eierstocksgewebe sollte erhalten bleiben.

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He was so benevolent, so merciful a man, that, in his mistaken compassion, he would have held an umbrella over a duck in a shower of rain.

—*Jerrold*

The liar's punishment is not in the least that he is not believed, but that he cannot believe anyone else.

—*Shaw*

Great occasions do not make heroes or cowards: they simply unveil them to the eyes of man.

—*Westcott*

I never knew a man who could not bear the misfortunes of another perfectly like a Christian.

—*Pope*

Laughter is not at all a bad beginning for a friendship, and it is far the best ending for one.

—*Wilde*

Lipoma of the Uterus

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AND
JOSEF NOVAK, M.D.
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Two cases of uterine lipoma in elderly women with uterine fibroids are reported. The possible pathogenesis of the tumor is discussed. Robert Meyer's hypothesis, which traces its origin to the inclusion of intermullerian lipoblastic tissue in the uterus during fusion of the mullerian ducts, is deemed most convincing.

LIPOMAS of the uterus are among the rarest of uterine tumors. Various authors have tried to collect all available cases from the world literature, with widely varying results. The highest number was recorded by Howe and Kellert, who compiled 41 cases published up to 1950 and included one of their own. As it is difficult to state in any given case whether a tumor designated as a "pure lipoma" really deserves this classification, or whether the fat tissue represents merely a constituent of a tumor of mixed composition such as myolipoma or fibrolipoma, there are naturally differences in the number of collected cases. Because of the rarity of this tumor, it appeared of interest to present two additional cases.

REPORT OF CASES

CASE 1.—The patient, a 60-year-old Negress, was admitted to Cook County Hospital because of moderate uterine bleeding of about six weeks' duration. The patient was married but, for some unknown reason, had never been pregnant. Her last menstrual period had occurred eleven years earlier, at the age of 49. The blood pressure in millimeters of mercury was 145 systolic and 80 diastolic. The further history and the results of general physical examination were noncontributory.

On admission, the abdomen was distended by a mass reaching up to the level of the umbilicus and bulging toward the left hypogastrium. On pelvic examination it proved to be a greatly enlarged uterus, apparently containing multiple nodular tumors. The cervix was atrophic, its external orifice of nulliparous shape. The vagina contained a brownish, foul-smelling discharge, but no fresh blood. Total abdominal hysterectomy with bilateral salpingo-oophorectomy was performed. The patient had an uneventful postoperative course and was discharged two weeks after operation.

Pathologic Picture.—The specimen (Fig. 1) consisted of a uterus weighing 1,700 Gm. measuring 15 by 15 by 10 cm. The cervix was submitted separately. The bulk of the specimen consisted of numerous firm greyish-white nodules, subserous and/or intramural, some of which were calcified. Section revealed that these nodules, which caused a marked disfigurement of the uterus and distortion of the uterine cavity, consisted of interlacing bundles of greyish-white tissue with foci of calcification. The center of the specimen was occupied by a bright yellow lobulated tumor mass measuring 10 by 7 by 5 cm., which arose from the posterior wall of the uterus and consisted of adipose tissue. The lobulated lipomatous tumor tissue appeared to be surrounded by compressed muscular tissue containing numerous gaping blood vessels. A second circumscribed nodule of lipomatous tissue, measuring 3.5 cm. in di-

From the Department of Pathology, Cook County Hospital, Chicago.
Submitted for publication February 9, 1961.

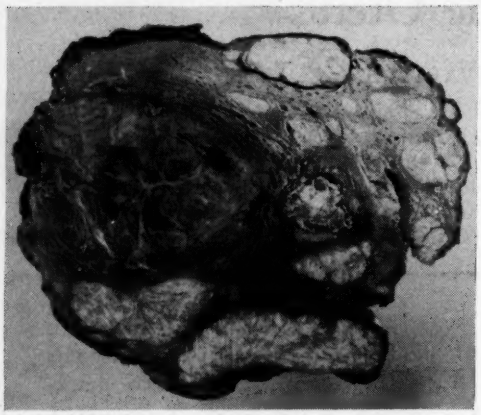

Fig. 1.—Hemisection through uterus, demonstrating multiple leiomyomas and lipoma (large darker nodule to left of center).

ameter, was situated anterior to the larger tumor.

The cervix, which was detached from the uterine corpus, appeared grossly normal. The walls of the fallopian tubes were slightly thickened. The ovaries were atrophic.

Samples for microscopic examination taken from the uterine wall in the area of the yellow tumor mass occupying the internal half of the wall revealed a circumscribed but not encapsulated tumor consisting predominantly of mature fat cells (Fig. 2). This typical fat tissue was subdivided by slender, moderately vascular fibromuscular septums (Fig. 3), which merged with the surrounding myometrial tissue. The muscular elements were differentiated from the connective tissue fibers by the Van Gieson stain. At the periphery of the tumor the fat cells were intermingled with myometrial fibers (Figs. 4 and 5).

Sections taken from the firm white intramural tumor nodules showed the typical appearance of leiomyoma (fibroid), with some degenerative changes, such as hyalinization, calcification and even bone formation. The endometrium was atrophic.

Section of the cervix revealed slight stromal infiltration by lymphocytes and plasma cells and moderate dilatation of the endocervical glands.

The walls of the fallopian tubes were infiltrated by lymphocytes and plasma cells; the mucosal folds were blunted and the lumens narrowed. The inflammatory infiltrates extended toward the respective ovaries.

Anatomic Diagnosis.—The anatomic diagnosis was (1) uterine lipomas, (2) multiple uterine leiomyomas, (3) bilateral chronic salpingo-oophoritis and (4) mild chronic endocervicitis.

CASE 2.—A 78-year-old white woman was admitted to the hospital because of severe uterine prolapse. Vaginal hysterectomy was performed. The postoperative course was uneventful, and the patient was discharged on the thirteenth postoperative day.

Pathologic Picture.—The specimen consisted of a uterus weighing 110 Gm. The cervical surface was smooth. The myometrium contained a single firm greyish intramural nodule 1.2 cm. in diameter and another intramural nodule 0.9 cm. in diameter, yellow and soft.

Microscopically, the endometrium was high and showed cystic dilatation of many of its glands. Some dilatation of the endocervical glands was also noted. The greyish intramural nodule consisted of compactly arranged, interlacing, smooth muscle bundles. The yellow intramural nodule, however, revealed fat cells as the predominant cell type, but also bundles of loose connective tissue dissecting the fat tissue. Scattered in the loose connective tissue, few muscle fibers were also seen, as demonstrated well in Van Gieson stained sections.

Anatomic Diagnosis.—The anatomic diagnosis was (1) uterine leiomyoma, (2) uterine lipoma and (3) endometrial hyperplasia.

COMMENT

Most uterine lipomas have been observed in women 50 to 70 years of age. Their occurrence in younger women is exceedingly rare. The youngest patient whose case is reported in the literature was 28.

Uterine lipomas are predominantly encountered in the corpus and only seldom in the cervix, where they may appear as endocervical polyps (Kaufmann, Kehrer and others). Kehrer estimated the relative frequency of corporeal to cervical lipomas as 8:3. According to some reports, the tumors have a predilection for the uterine cornua. Uterine lipomas are usually spherical and well delineated but not encap-

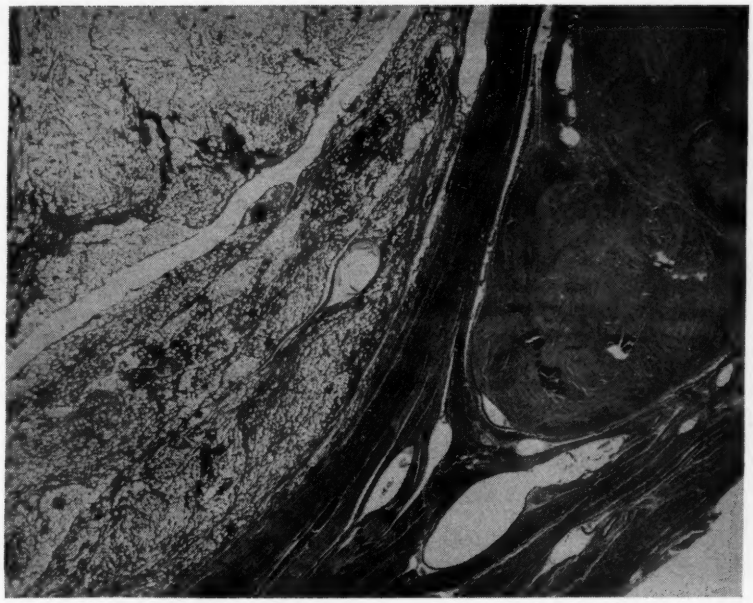

Fig. 2.—Circumscribed lipoma in the uterine wall, adjacent to small leiomyoma. (× 20.)

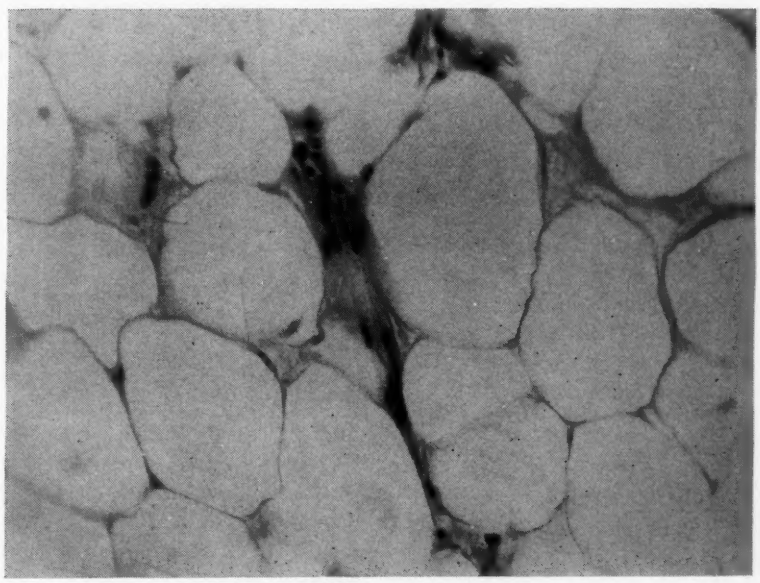

Fig. 3.—Lipoma, high power.

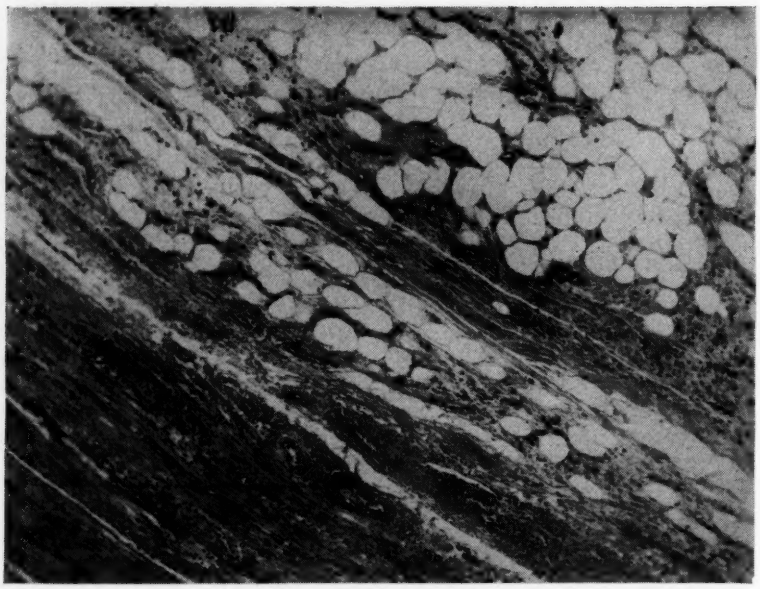

Fig. 4.—Periphery of tumor. Note infiltration of the myometrium by fat cells.

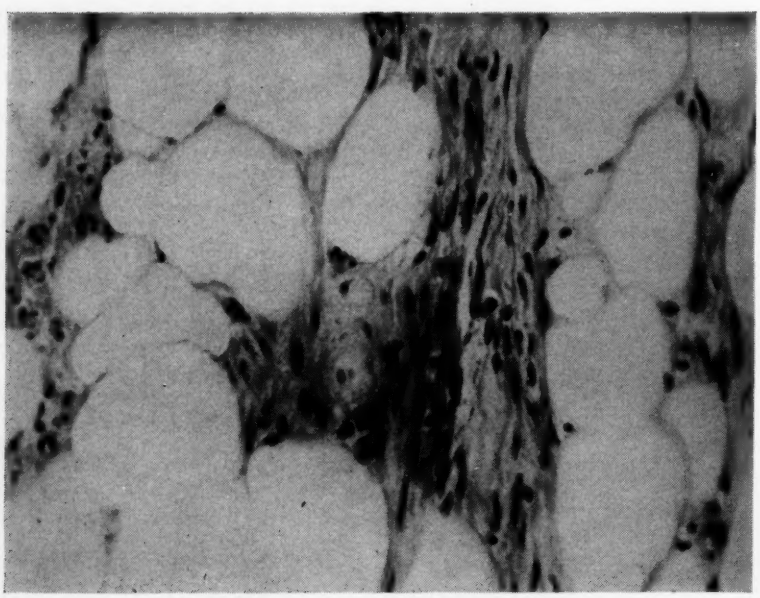

Fig. 5.—Same as Fig. 4, under high power.

sulated. They consist of mature fat tissue, with septums of fibromuscular connective tissue dividing them into small and large lobules. Malignant degeneration has been reported only in rare instances (Benneke, R. Meyer).

The fact that uterine lipomas are usually associated with fibroids may have some basic significance. On the other hand, their occasional coincidence with other tumors, such as endometrial carcinoma (Humphrey and Mustard) seems to be purely incidental and attributable only to the same age predilection.

Various attempts have been made to explain the histogenesis of uterine lipomas. Normally there are no lipoblasts or definite fat cells within the uterine wall. One of the theories tried to explain the genesis of the lipomas by postulating metaplasia of leiomyomas into fat tissue. Such metaplasia of differentiated smooth muscle cells into well differentiated fat cells, however, has not been proved and is improbable. Invasion of the uterus by lipoblastic tissue, associated with ingrowing blood vessels, has been postulated by some authors, but this mode of origin seems highly improbable, because in most of the reported cases the uterine lipomas developed in the fundus of the uterus, far from the entrance of the main uterine blood vessels into the uterine wall. Moreover, if this should occur, a higher incidence of lipomas in this organ would have to be expected.

The hypothesis of R. Meyer seems the most acceptable. Meyer traces the origin of uterine lipomas to the inclusion of tissue situated between the diverging upper parts of the müllerian ducts above their point of fusion. In this location the tissue resembles retroperitoneal tissue, possessing a lipoblastic propensity, as evidenced by the relatively high incidence of lipomas in the retroperitoneal space. This hypothesis would also explain the particular rarity of lipomas in the lower portion of the uterus, especially in the cervix, where the müllerian ducts are closely apposed from the start.

The question may arise why these tumors become manifest and grow in later life. It is possible that postmenopausal or senile atrophy of the uterus favors the growth of the fat tissue. Another possibility is the awakening of the slumbering lipomatous potentiality of the undifferentiated mesenchymal tissue.

ZUSAMMENFASSUNG

Es wird über zwei Fälle von Gebärmutterlipom bei älteren Frauen mit Bindegewebsgeschwülsten der Gebärmutter berichtet. Die Pathogenese dieser Geschwulstform wird erörtert. Die annehmbarste Hypothese scheint den Verfassern die von Robert Meyer zu sein, der die Entstehung dieser Geschwülste auf den Einschluss zwischen den Müllerschen Kanälen gelegenen fettbildenden Gewebes in die Gebärmutter während der Verschmelzung der Müllerschen Gänge zurückführt.

RÉSUMÉ

L'auteurs discutent deux cas de lipomes de l'utérus chez des femmes âgées et discute la pathogénèse possible de cette catégorie de tumeurs. L'hypothése de Robert Meyer, qui fait remonter l'origine de ces tumeurs à une inclusion de tissu lipoblastique intermullérien dans l'utérus durant la fusion des cannaux de Muller, est considérée comme des plus plausible.

RIASSUNTO

Vengono riferiti due casi di lipoma uterino associato a fibrosi in donne anziane. Viene discussa la patogenesi di questo tipo di tumore con riferimento all'ipotesi di R. Meyer il quale ritiene che esso deriv dall'inclusione di tessuto intermul-

leriano lipoblastico nell'utero durante la fusione dei dotti di Mueller.

RESUMEN

Se da cuenta en este trabajo de dos casos de lipoma uterino en enfermas de edad, con útero fibromatoso. El autor se extiende sobre la posible patogenia de esta entidad. Es acceptable la teoria formulada por Robert Meyer que considera estos lipomas como inclusiones del tejido lipoblástico intermulleriano dentro del útero durante el tiempo de fusión de los conductos de Müller.

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The great artists, the great thinkers, and the great religious teachers of the world have had quite other standards. They have valued the individual; they have praised spontaneous impulse; they have conceived the good life as one lived from within, not forced into conformity to an external mechanism. They have not sought to make men convenient material for the manipulations of rulers, but to make them spiritually free to pursue what they believed to be good, regardless of law and public opinion. This was the teaching of Christ, of Buddha, of Lao-tsze; in another form, the same emphasis on the individual is to be found in Shakespere, and in Galileo's resistance to the Inquisition.

—*Russell*

The Hormonal Therapy of Advanced Carcinoma of the Breast

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In the author's experience palliative hormonal therapy, properly used, brings about significant remissions in about 50 per cent of cases of disseminated mammary carcinoma. Though never, of course, curative, it may bring about remissions or regressions lasting from months to years.

CARCINOMA of the breast is the primary carcinoma that occurs most frequently in the female, accounting for about 22 per cent of all malignant tumors in women.

At the Fourth National Cancer Conference in Minneapolis in 1960, held under the joint sponsorship of the American Cancer Society and the National Cancer Institute, it was emphasized that the incidence and the mortality rate of this lesion have remained stationary for at least a quarter of a century.

In the United States, on the basis of the present population, there are about 50,000 new cases of mammary carcinoma each year, with some 25,000 deaths. Mammary carcinoma is the leading cause of death in women between 40 and 60 years of age.

It is estimated that about 5 per cent of all women over 40 will have mammary cancer and that, despite the best current modes of treatment, more than 60 per cent of these patients will at some time display the grim picture of metastatic disease.

The term "advanced breast cancer" includes all malignant lesions of the breast in patients who, when seen initially, have advanced local or regional mammary carcinoma or metastases, as well as those who have had primary care and now have recurrences or metastases.

The surgeon's armamentarium at present is not adequate to effect cure, but modern therapeutic measures can, in many cases, provide palliation and prolong useful and comfortable life. Subjective and objective remissions are frequent, and the duration of survival can be increased. In many cases, life can be made bearable and often enjoyable for significant periods.

In this paper I shall discuss the role of one of the methods of treatment used for disseminated mamary carcinoma, namely, hormonal therapy.

The hormonal therapy of carcinoma arising in the breast, which is an organ normally dependent on endocrine control, is based on the premise that the lesion retains some degree of dependence on the hormones of the host for a variable period before becoming autonomous. The dependent tumor retains characteristics of the normal cells from which it arises, and the tumor cells function like those of the tissue of origin. As has been pointed out carcinoma is not, at first, necessarily

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Submitted for publication April 28, 1961.

autonomous and intrinsically self-perpetuating, and it can be sustained and propagated by endocrines functioning at normal or even at subnormal levels.

The therapeutic use of hormones is based on these principles and is classified into (1) procedures designed to remove endocrine organs (surgical hormone ablation therapy) and (2) the administration of hormones to suppress or neutralize endogenous hormones (medical hormone additive therapy).

The proper form of hormonal therapy for advanced carcinoma of the breast varies according to the endocrine status of the patient. Patients under consideration for hormonal therapy, therefore, are divided into three basic groups, as follows:

Group 1.—Women who are actively menstruating.

Group 2.—Women who are in the menopause, either natural or induced, up to ten years after the menopause. Also included is the occasional woman who is well past the menopause but who shows evidence of active estrogen production.

Group 3.—Women who have passed the menopause ten or more years earlier: also, the rare patient who is much closer to the menopause but shows no estrogen activity.

Certain additional principles should guide the selection of patients for hormone therapy. They are as follows:

1. Hormone therapy is palliative, not curative, and should be used for patients who are beyond possible cure by operation or irradiation.

2. The lesion should be symptomatic or advancing when hormonal therapy is instituted.

3. The administration of hormones is not without complication, and in some cases the course of the tumor may be accelerated.

4. The operative mortality and morbidity rates associated with such ablation procedures as adrenalectomy and hypophysectomy must be carefully considered before these procedures are recommended.

5. At present there is no way of predicting with reasonable accuracy whether any given patient will respond to hormone therapy.

With these considerations in mind, however, it must be emphasized that the proper use of hormone ablative therapy or hormone additive therapy, either singly or in combination, will produce, in about 50 per cent of the cases of advanced mammary carcinoma, remissions lasting from months to years.

Bilateral Oophorectomy.—In 1896 Sir George Beatson first reported that inoperable mammary carcinoma in women could be induced to regress by excision of the ovaries, and Lett in 1905 reported a remission in 36.4 per cent of 99 patients so treated. Since then the pendulum of this procedure's popularity has been swinging back and forth.

The mechanism of action in which surgical castration produces its beneficial effects is probably based on estrogen deprivation of the hormone-dependent tumors, or to a preponderance of androgens, which favor protein synthesis, osteogenesis and hematopoiesis.

Until the necessity for oophorectomy in conjunction with adrenalectomy to eliminate all possible estrogenic sources was recently demonstrated, many clinics were using roentgen therapy to the ovaries rather than oophorectomy, to produce cessation of the menses. Although roentgen therapy can produce an artificial menopause, complete defunctionalization of the ovaries is often not obtained, as is demonstrated by urinary gonadotropins, estrogen excretion and histological examination of ovarian tissue and vaginal epithelium after irradiation.

In 1958 Treves reported objective remission in 44 per cent of 143 premenopausal women with recurrent or primary inoperable mammary carcinoma. These remissions had an average duration of more than fourteen months. Among postmenopausal women, objective remission occurred in 12 per cent.

The only noteworthy disadvantage of the procedure is the production of acute menopausal symptoms of varying degree, and its only contraindications would be major psychiatric problems or major medical reasons making surgical treatment hazardous. It is a simple procedure with minimal operative risk, and it brings about prompt and complete cessation of estrogenic ovarian production, with an objective remission rate twice as high as that associated with androgen administration. It is the best primary method of handling advanced carcinoma of the breast in premenopausal women and the relatively small number of postmenopausal patients in whose cases considerable estrogenic activity can be demonstrated by tests for urinary estrogens and vaginal cytologic studies.

Bilateral Adrenalectomy and Combined Adrenalectomy and Oophorectomy.—Huggins, in 1951, introduced and successfully performed bilateral adrenalectomy for metastatic carcinoma of the breast. This was made possible by the discovery of cortisone, which made it possible for adequate maintenance therapy to be supplied for life.

The basis for this procedure is the fact that after removal of the ovaries the human adrenal gland can secrete sufficient quantities of growth-promoting steroids to maintain dependent neoplasms.

Randall recently compiled, from the literature and from the Memorial Center series of 155 patients, data on 851 women who underwent bilateral adrenalectomy, with or without oophorectomy, for advanced carcinoma of the breast. In 43.4 per cent of the cases there were objective remissions. The mortality rate was 8.2 per cent. Nelson and Dragstedt, in February 1961, reported on 24 consecutive patients treated by combined adrenalectomy and oophorectomy for disseminated mammary carcinoma with objective remissions, in 58 per cent of the cases, lasting an average of forty-four months. In March 1961 the Joint Committee on Endocrine Ablative Procedures in Disseminated Mammary Carcinoma reported a pooled study of 404 cases from twelve centers in which adrenalectomy was performed, comparing it to a series of patients treated by hypophysectomy. In this series the induction of artificial menopause by oophorectomy or ovarian irradiation, preceding or concurrent with adrenal ablation, was successful in all menstruants. Very strict criteria were used to designate objective regression, which was defined as a distinct, measurable decrease in one or more dominant metastatic areas on clinical or roentgen examination, without progression of any other metastatic lesions and with no new foci for six or more months after the ablative procedure. No patients with only local recurrences were included in the series, and those in whom lesions remained in *status quo* were designated as failures. Objective remissions, by these strict standards, were observed in 31.7 per cent of the cases, lasting an average of twenty-two months and associated with a mortality rate of 9.1 per cent.

Adrenalectomized patients must be maintained by about 50 mg. of cortisone daily, desoxycorticosterone in injectable form and varying amounts of salt. I have found them somewhat more difficult to manage than are hypophysectomized patients, because of the electrolyte imbalance, but they seem healthy and are able to engage in all normal activities.

As in all cases in which hormone ther-

apy, is under consideration, there is no infallible method of determining which patients will respond, but the following points are helpful in the selection of patients for adrenalectomy:

1. A prolonged interval (more than three years) should have elapsed between mastectomy and the manifestation of metastatic involvement.

2. A patient who has previously responded to oophorectomy or androgens is likely to benefit from adrenalectomy, whereas one who failed to respond to oophorectomy will rarely show a remission after adrenalectomy.

3. Evidence of estrogenic activity, as shown by menopausal type of vaginal smear, seems to increase the chance of response.

4. Patients with well-differentiated mammary carcinoma tend to show an increased incidence of response.

5. The chance of response is increased in patients between the ages of 40 and 65.

The rate of objective regression after adrenalectomy is comparable to that for oophorectomy in the case of the premenopausal woman and is about twice the rate associated with androgen therapy. The average time lapse before regression is nearly two years and may be four or five years. Nevertheless, there are definite disadvantages. The operative mortality rate ranges from 4 to 10 per cent. Patients are dependent on cortisone maintenance for life. The ability to conserve sodium is reduced with the loss of adrenal aldosterone, and finally, the amount of cortisone must be increased whenever there is acute stress, is order to prevent acute adrenal insufficiency.

At present it is my practice to advise combined oophorectomy and adrenalectomy by an abdominal approach for menopausal patients, including periods up to ten years after the menopause, as a primary treatment for disseminated carcinoma of the breast. If a successful remission has been achieved earlier by oophorectomy, or if the ovaries have been removed prophylactically, adrenalectomy is recommended for premenopausal and menopausal women. It may also be used in the treatment of relapses following estrogen therapy in the late postmenopausal period.

Hypophysectomy.—In 1952, Luft, Olivecrona and Sjögren introduced hypophysectomy as a therapeutic measure for advanced mammary carcinoma.

Removal of the pituitary, which is the controlling gland of the endocrine system, eliminates the elaboration of gonadotropins and adrenocorticotropic hormone (ACTH) and has, therefore, the same effect on estrogen production as do adrenalectomy and oophorectomy. It has the added advantage of eliminating the growth hormone and prolactin, which, in some observers' opinion, affect the growth of the tumor.

Pearson and Ray of Sloan-Kettering Institute and New York Hospital have reported the largest series—343 cases—with an objective remission rate of 42 per cent and a mortality rate of 6.7 per cent. The report by the Joint Committee on Endocrine Ablative Procedures in Disseminated Mammary Carcinoma, previously referred to in the section on adrenalectomy, has much more rigid criteria for objective remissions. In this report comparable series, pooled from twelve centers and consisting of 404 cases of adrenalectomy and 467 cases of hypophysectomy, were studied. In both groups artificial menopause had been induced in most menstruants. An objective remission rate of 31.7 per cent, the remissions lasting an average of twenty-two months, with a mortality rate of 9.1 per cent, was observed in the adrenalectomy series, as compared to an objective remission rate of 31.3 per cent (lasting an average of twenty and six-tenths months), and

a mortality rate of 9 per cent in the hypophysectomy series.

Following hypophysectomy various degrees of diabetes insipidus, which is usually transient, develop, requiring Pitressin therapy. Posterior lobe snuff taken by an atomizer when the patient feels thirsty gives adequate control. Myxedema usually appears in several weeks, requiring thyroid therapy, and adrenal insufficiency develops unless treated by steroids. Patients must be maintained on about 35 to 50 mg. of cortisone daily and 120 to 160 mg. of desiccated thyroid. In 15 to 20 per cent of cases diabetes insipidus persists requiring the use of snuff for several months.

In general, hypophysectomy is contraindicated in patients with extensive pulmonary disease, hepatic metastases and intracranial metastases. As with adrenalectomy, the best results are obtained in patients between 40 and 65, with slow-growing, well differentiated carcinomas. Also as with adrenalectomy, patients who have shown a previous response to oophorectomy or androgens are likely to benefit from hypophysectomy.

Among premenopausal women the objective remission rate is comparable to that associated with adrenalectomy and with oophorectomy about twice that obtained with androgens. It too lasts for an average of nearly two years, though in some cases it may be maintained for several more years. In the hands of an experienced neurosurgeon, the mortality rate is about equal to that of adrenalectomy, and both procedures result in dramatic subjective improvement soon after the operation.

The advantages of hypophysectomy over adrenalectomy are as follows:

1. Oophorectomy is not necessary with hypophysectomy as it is with adrenalectomy.

2. Besides having the same effect on estrogen production as combined oophorectomy and adrenalectomy, hypophysectomy eliminates the growth hormone and prolactin, which may affect the growth of the carcinoma.

3. Some patients in whom a remission has followed oophorectomy and adrenalectomy may have another remission after hypophysectomy.

4. Hypophysectomized patients are somewhat easier to manage than those who undergo oophorectomy and adrenalectomy, since the electrolyte balance is not influenced by the operation.

5. Remission, in some series, seem to last somewhat longer than after adrenalectomy, although this is not confirmed by the pooled comparative series aforementioned.

The disadvantages are as follows:

1. In most cases, diabetes insipidus, in varying degrees, follows the operation.

2. In a small number of cases there may be serious visual disturbances.

3. Operations involving the brain are not as well accepted by patients as are abdominal surgical procedures.

4. Complete removal of the pituitary is difficult and requires an experienced neurosurgeon. Even then, removal is incomplete in about one-third of the cases, although in some of them remissions may occur.

Hypophysectomy or adrenalectomy plus oophorectomy should be the primary form of therapy for disseminated mammary carcinoma in women at the menopause and up to ten years thereafter. It is an excellent second procedure for relapses following oophorectomy in the premenopausal group or estrogen therapy in the late postmenopausal group.

Androgens.—The mechanism by which androgens produce remissions of mammary carcinoma is debatable. It has been

postulated that androgens neutralize or antagonize estrogens; that they cause medical hypophysectomy by depressing pituitary function, or that they may have a fundamental anabolic effect by favoring protein synthesis, osteogenesis and hematopoiesis.

Androgen therapy may be used for female patients of any age, but it is most effective in women at the menopause and in the ten succeeding years. It is most useful for patients with osseous metastases; it has little effect on lesions of soft tissue. Objective remission occurs in only about 23 to 25 per cent of cases, is usually not demonstrable for three to five months and lasts only for an average of eight months. Subjective improvement, with relief of pain and a sense of well-being, however, occurs in 60 per cent or more of cases and frequently appears within a few weeks after the beginning of therapy.

The most serious unfavorable effect is the production of hypercalcemia in about 10 to 14 per cent of the patients. This suggests an acceleration of tumor growth and requires immediate cessation of the therapy. Other side effects are manifestations of masculinization—hirsutism, deepening of the voice, acne, facial flush and an increase in libido. Edema is also observed, owing to salt retention.

Testosterone propionate is administered intramuscularly, in doses of 100 mg. three times a week. In my hands, the oral administration of androgens has not been satisfactory. If possible, therapy is continued for at least three months to determine whether objective regression will occur. If a favorable response is obtained, it should be continued until there is a relapse. Subsequent trials are seldom effective.

Recently I have been using a new compound, nor-testosterone phenylpropionate or nandrolone phenpropionate, which is sold under the trade name of Durabolin. Compared to testosterone, it has reduced androgenic properties but has had strongly increased anabolic effects. It has an anabolic effect twelve times as powerful as that of testosterone propionate; it reduces calcium excretion in patients with osseous metastases; it has little virilizing effect; the danger of hypercalcemia is considerably smaller than with testosterone, and it requires only a weekly intramuscular injection of 50 mg.

As has been pointed out by Ford, van der Werff, Nowakowski and Parada, it seems to be a valuable drug in the therapy of disseminated mammary carcinoma.

Although my own series is too small to justify drawing definite conclusions, I have noted significant subjective and objective improvement, with minimal side effects. In nearly all patients treated a pronounced general improvement in well-being has occurred.

In my opinion, androgen therapy should never be used as a substitute for castration in the premenopausal woman, since the latter is much more effective. It may be used as a primary measure for the menopausal patient with painful bone disease or as a secondary measure for patients with recurrent osseous disease after cessation of response to oophorectomy, adrenalectomy, hypophysectomy or estrogen therapy.

Estrogens.—Haddow, in 1935, introduced the administration of estrogens to women with mammary carcinoma. The paradox of their use to suppress mammary carcinoma when it is assumed that they may be activating agents of the same lesion was explained by Huggins, who showed that in the castrated rat small amounts of estrogen promote the growth of mammary carcinoma, while large doses inhibit it. In all probability, large doses act by suppression of the anterior pituitary gonadotropins, producing a medical hypophysectomy.

Estrogen therapy should be used only for patients with advanced carcinoma of the breast who are ten or more years past the menopause. In this group objective remissions are obtained in 50 to 60 per cent of cases in which there are metastases to soft tissue and in 20 per cent of those with osseous metastases. On the average, these remissions last about one year, in some cases continuing for two years or more.

The principal side effect of estrogen therapy is retention of fluid due to sodium retention and requiring a low sodium diet and diuretics. Hypercalcemia is observed in about 7 per cent of patients with osseous metastases. It requires cessation of therapy. Other side effects are gastric disturbances, vaginal bleeding, frequency of urination, incontinence of urine, cardiac enlargement, congestive failure and areolar pigmentation.

Therapy may be given by oral administration of diethylstilbestrol, 5 mg. orally three times a day or ethinyl estradiol (estinyl), 1 mg. three time a day, or estradiol benzoate 5 mg. intramuscularly three times a week. Therapy should be continued, if possible, for at least three months to see whether any objective remission occurs; if it does, the treatment should be continued until recurrence is noted. Earlier withdrawal may cause a second regression.

In my opinion, estrogen therapy is the most satisfactory primary treatment for patients who are ten or more years past the menopause and who have carcinoma of the breast in an advanced stage.

Corticosteroids.—Massive doses of cortisone or other adrenal steroids for disseminated mammary carcinoma act to depress pituitary function and to cause secondary atrophy of the adrenal cortex, thus producing a medical adrenalectomy.

Objective regressions are obtained in about 25 to 30 per cent of cases. These last only about three to four months on the average, though occasionally as long as one to four years. Subjective improvement, however, is dramatic, with a definite sense of well-being, increased appetite, relief from pain and stimulation of energy.

Therapy is initiated by giving 1500 to 300 mg. of cortisone or 40 to 60 mg. of prednisolone orally each day, with a gradual reduction to maintenance levels of 50 to 100 mg. and 20 to 30 mg. respectively. Precautions should be taken against gastric hyperacidity and fluid retention. Therapy should be continued for as long as the beneficial effects continue and then should be slowly withdrawn.

Corticosteroid therapy evokes a good response from patients with hypercalcemia and acquired hemolytic anemia associated with advanced mammary carcinoma. The best results are obtained in patients who have shown a previous response to oophorectomy. This form of therapy should be reserved for those patients in whom recurrence follows androgen or estrogen therapy or there has been no response to the treatment.

SUMMARY

Hormonal therapy is palliative, not curative, but when properly used, either singly or together, hormone ablative or additive therapy, in about 50 per cent of the cases of disseminated mammary carcinoma, will produce remissions lasting from months to years.

In the author's opinion the primary form of hormonal therapy for the premenopausal woman with advanced carcinoma of the breast should be bilateral oophorectomy, in the menopausal patient adrenalectomy plus oophorectomy, and in the late postmenopausal patient the administration of estrogen.

Either adrenalectomy or hypophysectomy is an excellent second procedure for

relapses following oophorectomy in the premenopausal group or estrogen therapy in the late postmenopausal group.

Androgen therapy may be used primarily for the menopausal patient with painful disease of bone or secondarily for patients with recurrent osseous disease after cessation of response to oophorectomy, adrenalectomy, hypophysectomy or estrogen therapy.

Cortisone therapy should be reserved for patients with hypercalcemia or acquired hemolytic anemia and for those who show recurrences after androgen or estrogen therapy or failure of response to them.

RESUMEN

La terapeútica hormonal en el carcinoma mamario es paliativa, pero no curativa. Si se aplica adecuadamente, es decir usando solas o cambinadas la sustracción o la adición de hormonas se consigue en los casos de carcinoma diseminado una remisión de varios años en mas del 50 de los casos.

La opinión del autor es que el esquema primario de terapeútica hormonal debe ser para las mujeres premenopaúsicas con carcinoma avanzado la ooforectomía bilateral, para las menopaúsicas ooforectomía y adrenalectomía y en las menopaúsicas de ya mucho tiempo administración de estrógenos.

La terapia con andrógenos puede usarse de comienzo en las enfermas menopaúsicas con lesiones óseas muy dolorosas y secundariamente en enfermas con lesiones óseas recurrentes cuando ha cesado la acción de la oooforectomía, la adrenalectomía, la hipofisectomía o la terapeútica con estrógenos.

ZUSAMMENFASSUNG

Die Hormonbehandlung führt nicht zur Heilung des metastasierenden Brustkrebses, sondern stellt nur eine palliative Massnahme dar. Wenn aber die Ausschaltung oder die Zufuhr gewisser Hormone oder eine Kombination beider Verfahren richtig durchgefürt wird, kann es in etwa 50 Prozent der Fälle zu Remissionen von der Dauer von Monaten oder Jahren kommen.

Nach Ansicht des Verfassers sollte die primäre Form der Hormonbehandlung von Frauen mit vorgeschrittenem Brustkrebs vor dem Klimakterium in der beiderseitigen Eierstocksresektion, bei Frauen in den Wechseljahren in Nebennieren- und Eierstocksresektion und bei Patientinnen im späten postklimakterischen Alter in der Verabfolgung von weiblichen Geschlechtshormonen bestehen.

Die Resektion der Nebennieren oder der Hypophyse ist ein ausgezeichnetes sekundäres Verfahren zur Behandlung von Rückfällen nach Eierstocksresektion bei praeklimakterischen oder nach Eierstockshormonbehandlung der späten postklimakterischen Patientinnen.

Die Behandlung mit männlichem Geschlechtshormon eignet sich als primäre Massnahme bei klimakterischen Patientinnen mit schmerzhafter Knochenerkrankung oder als sekundäres Verfahren bei Patientinnen mit rückfälliger Knochenerkrankung, wenn sie auf die Resektion der Eierstöcke, der Nebennieren oder der Hypophyse oder auf die Zufuhr von weiblichen Geschlechtshormonen nicht mehr ansprechen.

Die Behandlung mit Kortison sollte für Patientinnen reserviert bleiben, die eine Blutkalkspiegelerhöhung oder eine erworbene hämolytische Anämie aufweisen und für solche, bei denen es nach Behandlung mit männlichen oder weiblichen Geschlechtshormonen zu Rückfällen kommt, oder die auf die Geschlechtshormone nicht mehr ansprechen.

RÉSUMÉ

La thérapeutique hormonale est palliative, non curative, mais, appliquée judi-

cieusement, soit seule soit combinée, elle peut amener dans environ 50% des cas de carcinome mammaire disséminé, des rémissions pouvant durer de quelques mois à plusieurs années.

L'auteur estime que la première forme de thérapeutique hormonale à appliquer en cas de carcinome avancé du sein à la période préménopausique, devrait consister en une oophorectomie bilatérale; à la période de la ménopause: surrénalectomie plus oophorectomie; à la période post-ménopausique: administration d'oestrogènes.

La surrénalectomie ou l'hypophysectomie sont toutes deux d'excellentes thérapeutiques secondaires pour les rechutes après oophorectomie dans le groupe préménopausique ou après un traitement aux oestrogènes dans le groupe post-ménopausique avancé.

Les androgènes peuvent être utilisés au state primaire du traitement pour les malades à la période de la ménopause souffrant d'une affection osseuse douloureuse, ou au stade secondaire pour les malades présentant une récidive d'affection osseuse après la fin de l'effet de l'oophorectomie, de la surrénalectomie, de la surrénalectomie, de l'hypophysectomie ou des oestrogènes.

La cortisone devrait être réservée aux malades présentant une hypercalcémie ou une anémie hémolytique acquise, ainsi qu'à celles faisant des récidives après une thérapeutique aux androgènes ou aux cas dans lesquels ces thérapeutiques ont échoué.

RIASSUNTO

La terapia ormonale ha carattere palliativo e non curativo, ma quando venga impiegata giudiziosamente, sia da sola che associata a terapia chirurgica, puo' condurre, in circa il 50% dei carcinomi mammari disseminati, a delle remissioni che durano mesi o anni.

L'autore e' dell'avviso che la terapia ormonica debba essere attuata mediante ovariectomia bilaterale nelle donne che non hanno raggiunto la menopausa, mediante ovariectomia e surrenalectomia nelle donne in menopausa e mediante somministrazione di estrogeni in quelle in menopausa avanzata.

Tanto lasurrenalectomia quanto l'ipofisectomia rappresentano un eccellente mezzo terapeutico di secondo impiego nelle recidive dopo ovariectomia (donne in premenopausa) o dopo estrogenoterapia (done in premenopausa) o dopo estrogenoterapia (donne in menopausa avanzata).

La terapia con androgeni puo' essere usata subito nelle donne in menopausa con metastasi ossee dolorose o secondariamente nelle donne in cui compaiano metastasi ossee dopo ovariectomia, surrenalectomia, ipofisectomia o estrogenoterapia.

La terapia cortisonica deve essere riservata alle pazienti con ipercalcemia o anemia emolitica acquisita e a quelle in cui siano comparse recidive dopo androgeno o estrogenoterapia.

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Editor's Note: At the request of Dr. Clarence Schneiderman, co-author with Dr. George J. Strean of the article "Ureteral and Urethral Injuries Associated with Gynecologic and Obstetric Practice" (J. Internat. Coll. Surgeons 35:484-494 [April] 1961), we wish to announce that the customary credits for certain of the illustrations were inadvertently omitted by the authors, who wish to assure all concerned that the omission was entirely accidental, and to extend their sincere apologies and regrets.

The illustrations were from *Traité de Technique Chirurgicale*, Tome VIII, published by Masson et Cie., 1956, and credits for Figs. 2, 4 and 6 should go to Dr. R. Küss and to Dr. L. Quénu (Fey, Dossot, Quénu).

Otorhinolaryngologic Surgery

Surgical Treatment of the Middle Ear for Otosclerosis: Modern Concepts

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The author describes an operation designated as vein plug stapedioplasty, which in his hands has restored—and maintained for at least two years—the maximum achievable hearing in 90 per cent of the cases. Although the procedure is not entirely without risk, technics previously employed, he points out, have no such high rate of success and have produced as many failures, if not more.

NUMEROUS variations of the technic of surgical treatment of the stapes are currently employed to improve hearing in cases of impairment due to otosclerosis.[1] This suggests that there is little unanimity among otologists with regard to the relative effectiveness of these technics. It may suggest, also, many personal preferences as to the means of achieving the same goal, without concern for the comparative merits of the several technics. Research, which has lagged far behind surgical progress during the past several years, has produced little to clarify these issues. One must turn in retrospect, therefore, to the main source of the available data—past accomplishments.

The various operations with which considerable experience has accumulated may be classified as follows: (1) mobilization of the stapes; (2) incudostapedial arthroplasty,[3] and (3) incudovestibular arthroplasty.[4]

Mobilization of the stapes has proved to be limited in its application. The stapes may be mobilized in some instances by the indirect method, which consists of applying pulsating pressure with a pick or probe to the head or neck of the ossicle. The direct method, in which chisels or picks are applied to the periphery of the footplate, increases the likelihood of achieving mobilization.

Incudostapedial arthroplasty employs transposition of the crura or substitution of the stapes for the crura and mobilization of part or all of the footplate. The substitute frequently used is wire or plastic tubing. This method also has limited

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Read at the Twenty-Sixth Annual Congress of the North American Federatic , International College of Surgeons, Chicago, May 14-18, 1961.

Submitted for publication June 5, 1961.

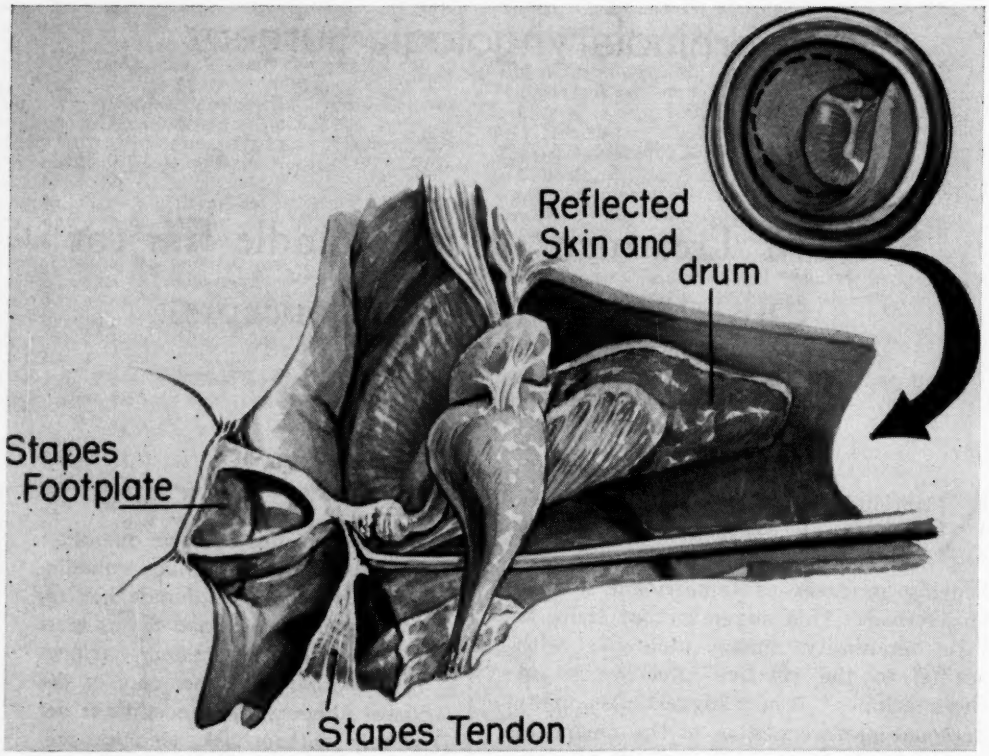

Fig. 1.—Anatomic view of surgeon's transtympanic approach to incudostapedial joint for vein plug stapedioplasty. Insert shows surgeon's view for making peritympanic incision.

application, owing to the various dispositions of otosclerotic involvement.

Incudovestibular arthroplasty consists of partial or complete platinectomy (resection of the footplate) and its replacement by a tissue graft or plug, with repositioning of the crura to establish continuity; or the crura and head of the stapes may be extracted and replaced with stainless steel suture wire or plastic tubing. The various tissues that have been used are vein, fascia, fat, gelfoam and, in isolated instances, such plastic materials as ostamer and silicone.

This condensed classification does not include all of the variations and modifications that may be employed in operating on the stapes, but recent reports indicate that these and other technical variations have been used with remarkable success.[5] Obviously, certain of these methods are limited to specific otosclerotic dispositions; others may be used routinely and consistently, regardless of the otosclerotic pattern encountered. A valid contention is that the extent and depth of otosclerotic involvement cannot be accurately assessed unless the superstructure of the stapes is removed and the entire footplate divested of its mucoperiosteum. As a consequence of having produced this stage of exposure, the surgeon is committed to one of the prosthetic procedures classified as incudostapedial arthroplasty and incudovestibular arthroplasty.

Nearly all the disappointments referable

to mobilization of the stapes apply to the various forms of incudostapedial arthroplasty.[6] Mainly, these consist of

(1) failure to secure a high enough rate of maximum improvement in hearing because the footplate is not removed, and (2) the excessive incidence of regression, even if maximum hearing improvement is achieved initially, because of recurrent ankylosis of the footplate.

A rather extensive experience of this sort, naturally, led to total or subtotal stapedectomy with various tissue replacements and the use of columnellar struts.

As yet it is not known which of the tissues commonly used to supply a new footplate produces the best results. Essentially the same complications may occur whichever is used. These complications range from eventual otosclerotic regeneration to chronic or recurrent perilymph escape, through fistulas that result in cochlear degeneration, to labyrinthitis, with its catastrophic consequences.[7] A porous material, such as gelfoam; a loculated tissue, such as fat, or a thin, flat material such as a vein graft is, in my own opinion, less effective as a firm seal of the oval window than is section of vein used as a plug. Foreign materials, such as silicones and other plastics, must depend on fibrous tissue to fill in or cover the gap between the prosthesis and the oval window margins to secure protective sealing of the vestibule. Connective tissue without a natural limiting membrane is more likely to cause fibrosis of the vestibule.

There is no evidence that any of these

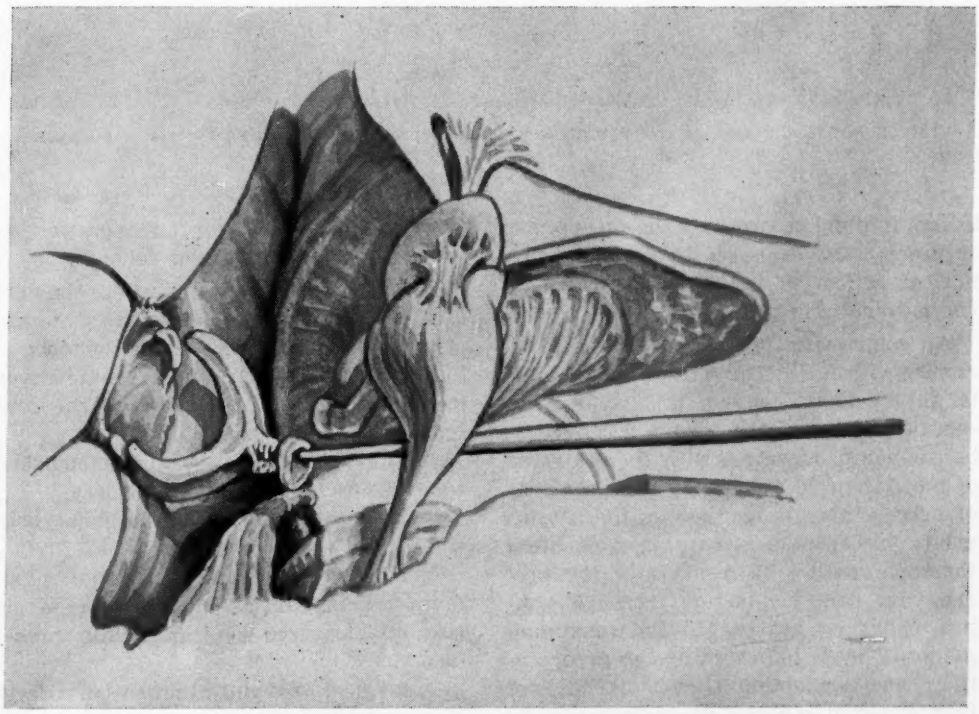

Fig. 2.—Anatomic view of surgeon's transtympanic approach to separating incus from stapes and removing capitulum and crura to expose otosclerotic footplate.

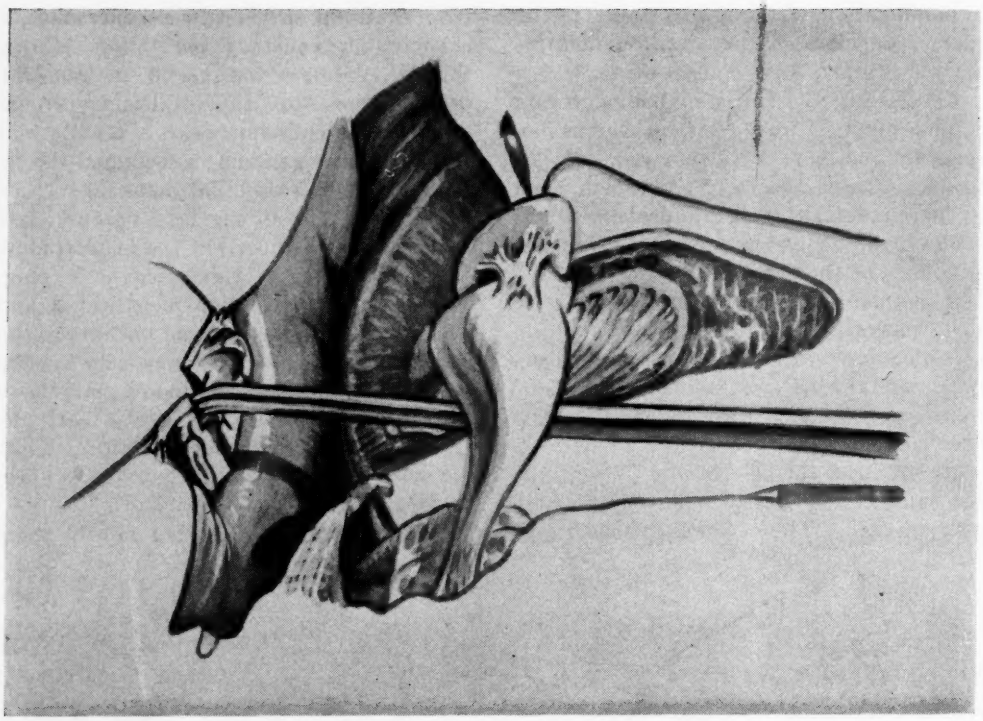

Fig. 3.—Anatomic view of transtympanic surgical approach to extracting footplate of stapes.

tissues inhibits or prevents the recurrence of otosclerosis. Apparently this is a function of endocrine influence about which virtually nothing is known.

An aggressive operation of this kind carries with it a certain risk of instrumental injury to the base of the cochlea, the saccule and the utricle. Such risks are to be compared, however, with success rates of more than 90 per cent. The definition of success may be defined as the attainment of a postoperative air conduction threshold within 10 decibels of the preoperative bone conduction threshold. Improvement of hearing to the maximum potential levels indicated by the preoperative bone conduction thresholds has not been achieved so regularly and consistently by any other surgical approach.

The requirements for an operation to produce such results are as follows:

1. Creation of a fenestra where the natural development of the hearing mechanism intended it to be, the oval window.
2. Application of a thick elastic cover to protect the oval window and the contents of the labyrinth.
3. Substitution of a mobile membrane for the otosclerotic stapes footplate.
4. Restoration of the functional continuity of the ossicular chain.
5. Preoperative predictability of maximum hearing improvement based on accurately measured bone conduction thresholds.

A surgical procedure that satisfies these requirements, with minimum trauma, firmness of oval window protection and a high

rate of successful hearing results is the vein plug stapedioplasty. Since this procedure has been described in detail, from the surgeon's point of view, elsewhere,[6b] an anatomic point of view is used to illustrate the procedure here (Fig. 1). A peritympanic incision permits elevation of an epithelial cuff and the posterior portion of the tympanic membrane to expose the incudostapedial joint. The stapedial tendon is severed and the superstructure of the stapes extracted (Fig. 2). Prior to removal of the footplate the prosthesis is made.

A section of vein 4 mm. long and approximately 2.5 mm. in diameter, taken from the back of the hand, is secured by a simple knot to a strand of No. 6-0 gauge stainless steel suture wire measuring not less than 4.5 and not more than 5 mm. in length. The resulting vein plug is inserted into the oval window niche immediately after stapedectomy, with the distal end of the wire looped over the long process of the incus and crimped firmly in place (Figs. 3 and 4). This provides for restoration of the continuity of the ossicular chain and the mechanical function of the auditory system.

It is important to remove otosclerotic projections that overhang the footplate, and also to remove as much of the involved footplate as possible without inflicting injury to the vestibular organs. The mucoperiosteum should be reflected to the extent of 3 to 4 mm. from the margins of the oval window.

Excessive bleeding into the vestibule and loss of perilymph are to be avoided. A firm seal of the oval window should be

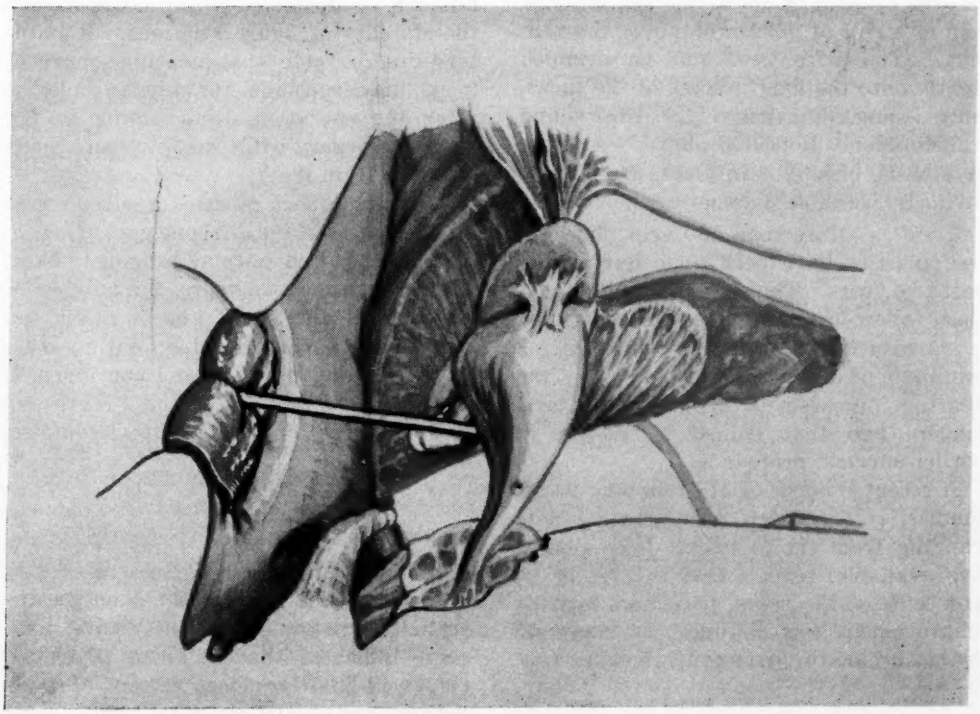

Fig. 4.—Anatomic view of vein plug sealing oval window and stainless steel suture wire connected to incus to restore mechanical function of hearing system.

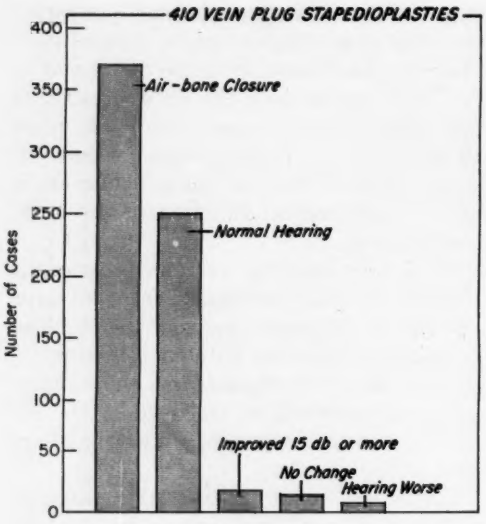

Fig. 5.—See text.

assured by placing additional segments of vein or strips of gelatin film over the vein plug. The wire need not be crimped tightly onto the long process of the incus. Only a snug contact is required for sound transmission. Repeated palpations of the prosthesis, once it is in place, are sure to invite irreversible damage to the cochlea.

Results.—More than 500 vein plug stapedioplasties have been done during the past two years. The current results and a close follow-up of past results show that it is productive of excellent results with a minimum of disappointments, and that the hearing improvement is better and lasts longer than that gained by means of earlier surgical procedures.

A recent analysis of 410 vein plug stapedioplasties on which postoperative data ranging from six to twenty-four months are available, reveals that in 370, or 90 per cent, of the cases, maximum hearing improvement was obtained, as measured by closure of the pure tone air-bone gap* (Fig. 5). Two hundred and fifty, or 57 per cent, of the 410 operations produced normal hearing (0-10 decibels). Forty operations did not result in closure of the air-bone gap, but 18 of the patients showed a hearing gain of 15 decibels or more. Fourteen showed no change in hearing after six months and 8 were made worse to such an extent that in their cases the operations must be considered complete failures. This constitutes a hearing casualty risk of 2 per cent.

The longest-term results of this procedure are those of the first 100 operations, done more than a year prior to the time of writing. The data on this group were first reported in May 1960.[4a] There has been some slight shifting of data from among these results, but it appears that the downshifts that occurred as time passed were compensated for by an equal number of upshifts, which accounts for the stability of figure relations. It is interesting to note that hearing improvement may continue for several months after the operation, thus adding to the success category while the few regressions subtract from it.

The first report revealed a success rate of 90 closures of the air-bone gap, of which 52 had produced normal hearing. Now, after more than two years, the number of closures remains at 90, and 56 of the patients have normal hearing. Within these figures it was noted that 4 continued to gain after the first report and 4 regressed, in 1 of the latter with eventual complete loss of hearing.

COMMENT

If it were not for a success rate above 90 per cent the failures could not be tolerated. A review of the literature, however, indicates that technics previously employed have produced fewer successes, both in quality and quantity, and as many or more failures.

*Closure of the air-bone gap is defined as an average difference of 10 decibels or less between the preoperative bone conduction and the postoperative air conduction at 512, 1,024, and 2,048 cycles per second.

Causes of failure may be listed as follows:[8]

1. Errors in selection
2. Excessive instrumental trauma
3. Infection (labyrinthitis)
4. Regeneration of otosclerosis
5. Fibrosis of the vestibule
6. Round window otosclerosis
7. Failure to achieve incudovestibular continuity
8. Trauma due to noise

Some of these causes of failure may be avoided. Others are incidental to unknown factors related to the nature of otosclerosis and its causes. It is encouraging to note that a surgical technic which does not entirely eliminate these factors can and does produce such favorable hearing results.

CONCLUSIONS

The general trend in surgical treatment of the middle ear for otosclerosis is in the direction of stapedectomy and tissue replacement to reestablish the continuity of the ossicular chain.

Some procedures have limited application, because of the extent and disposition of the otosclerosis in the oval window niche. Others may be used routinely and consistently, regardless of the otosclerotic pattern involved.

The relative merits of the tissues currently in use as substitutes for the stapes have not been precisely evaluated.

Some of the causes of failure may be avoided once they are recognized. Others are beyond control because of the basic unpredictable nature of otosclerosis.

Vein plug stapedioplasty has restored and maintained, for at least two years, maximum achievable hearing in 90 per cent of the operations. It appears to fulfill the requirements of the modern concepts of incudovestibular arthroplasty.

RÉSUMÉ

Dans le traitement chirurgical de l'oreille moyenne, la tendance générale est à la stapédectomie et au remplacement des étriers par du tissu, afin de restaurer la continuité de la chaîne des osselets. La valeur des différents tissus actuellement utilisés à cet effet n'a pas encore été évaluée avec précision.

L'auteur note également que la stapédioplastie avec tamponnement veineux a permis d'obtenir et de maintenir, pour deux ans au moins, le maximum possible d'audition dans 90% des cas.

RIASSUNTO

Nella cura chirurgica dell'orecchio interno il metodo corrente e' rappresentato dalla stapedectomia con sostituzione della staffa mediante tessuti allo scopo di ricostituire la continuita' della catena degli ossicini. I tessuti necessari a questo scopo non sono ancora ben stabiliti.

L'autore fa presente, inoltre, che la stapedioplastica e' in grado di restituire e mantenere per almeno due anni il massimo possibile di udito nel 90% dei casi.

RESUMEN

En la cirugía del oído medio existe la tendencia hacia la estapediectomía seguida de una plastia con tejido para mantener la continidad en la cadena de huesecillos. Todavía no hay acuerdo sobre qué clase de tejido se ha de emplear en la plastia.

El autor señala también que la estapedioplastia con tejido venoso restablece y mantiene en lo máximo la audición por lo menos durante dos años.

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Jerome Fracastor, or, as he called himself in his Latin works, Hieronymus Fracastorius, was a physician, astronomer, musician, botanist, geologist, and poet. Fracastor, according to his biographers, was born with such a small mouth that he was unable to drink or eat. A surgeon was called who operated upon his mouth and enlarged it so he was able to take food. Later, while still an infant, his mother was struck by a thunderbolt while carrying the young Jerome in her arms. The mother was instantly killed, but the infant escaped without injury. Fracastor grew to manhood, studied at the famous University of Padua, and settled in Verona. He practised medicine in Verona and when not busied with his patients, wrote poetry for relaxation. He was a physician with a large practice, numbering many crowned heads among his clientele, and wrote many remarkable treatises on medicine. He was perhaps the first physician to study contagious diseases carefully and to express the belief that they were due to germs too small to be seen by the unaided eye. He also was one of the first to grasp the fact that fossils are the remains of prehistoric animal and plant life.

—*Major*

Proctosigmoidoscopy: An Improved Technic Based on Experience in More than 1,000 Cases

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For proctosigmoidoscopic examination the author has adopted the use of a new position for the patient, which he designates as the modified (shoulder elevated) left lateral position. In his experience, this position, combined with the use of a sigmoidoscope of small caliber, has proved ideal for routine proctosigmoidoscopic procedures.

THIS paper has a twofold purpose: (1) to describe and advocate an improved positioning and technic for routine proctosigmoidoscopy in adults; (2) to show that this position and technic result in visualization of a longer segment of the distal portion of the colon than is possible by any other position and technic.

The medical literature is replete with statements that the best position of the patient for routine endoscopic study of the distal 10 inches (25 cm.) of the colon is "upside down." A few advocate the more rational lateral position. Buie, Nesselrod, Bacon, Ross and Recio, Lamphier, Turell, Bingham, Coller and others, advocate some type of inverted position. Most of these authors either give no reason for their preference or give the dubious reason that an inverted position results in elongation of the colon and displacement of the pelvic viscera, with resultant more effective examination. No one, to my knowledge, has presented *statistical* proof that an inverted position is superior to a lateral position.

In spite of the respected opinions of many of my colleagues, I disagree with their teachings and submit that an inverted position for routine proctosigmoidoscopic examination of the distal portion of the colon is contraindicated, for the following reasons: (1) it is extremely uncomfortable for most, and embarrassing for many patients; (2) it may be dangerous for the acutely ill, the aged, the juvenile, the arthritic, the obese and the patient with cardiac disease; (3) occasionally, a patient slides headlong off the examining table, and (4) the inverted position defeats the primary purpose of the examination, namely, the visualization

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Submitted for publication May 3, 1961.

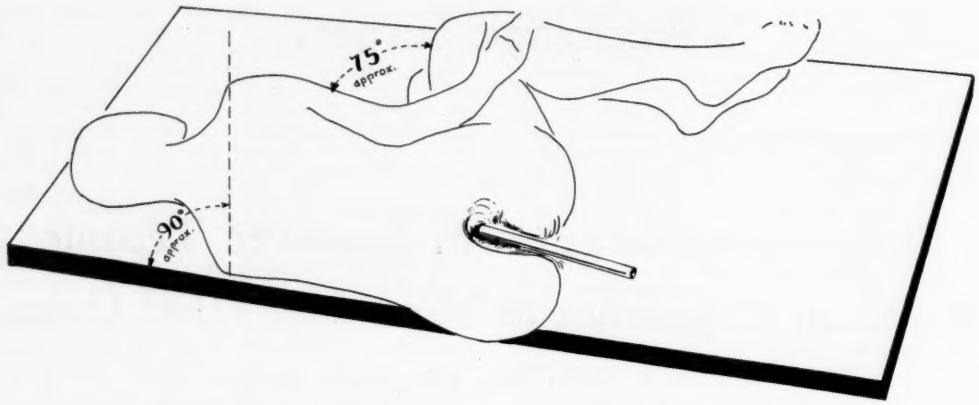

Fig. 1.—Diagram showing patient in conventional left lateral position.

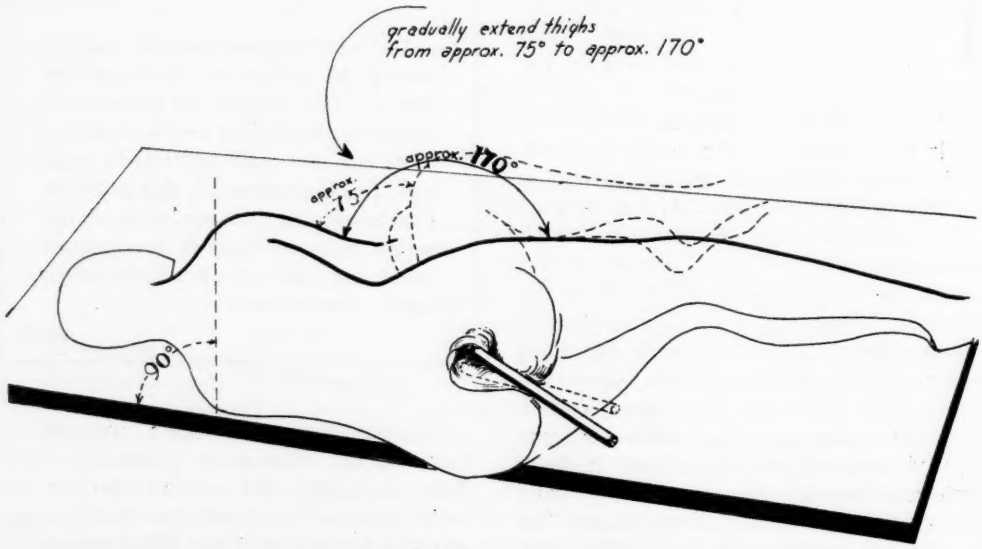

Fig. 2.—Diagram of patient in left lateral position, showing thigh maneuver (see text).

of as much of the lower segment of the bowel as possible. With the patient in an inverted position, in which the bowel wall, and with it the mucosa, admittedly falls away from the end of the instrument, it is conceivable that a mucosal lesion may also descend out of the examiner's view.

I first fully realized the advantages of a lateral position for sigmoidoscopic procedures in 1956, when, during a three-month period, I detected low sigmoidal neoplasms (3 adenomatous polyps and 1 carcinoma) in 4 patients who continued to have bloody stools after negative results had been obtained by examination in an inverted position and from a barium

enema. During the same period, low sigmoidal lesions were discovered in 3 patients with cardiac disease, in whose cases it was necessary to elevate the head end of the table because of respiratory embarrassment. These cases convinced me that not only was a lateral position more acceptable to the patient but that it appeared ideal from the diagnostic point of view.

Accordingly, in 1956 I began doing all sigmoidoscopic procedures with the patient lying on the left side on a flat examining table, with the left buttock just overhanging the edge of the table and the thighs flexed on the abdomen at an angle of between 75 and 90 degrees (Fig. 1). In many patients, however, it appeared that the advance of the scope was limited by a rigid or semirigid coccyx and by tension of the anococcygeal musculature—the same limitation that occurs with the patient in an inverted position. It was noted that this difficulty could be overcome in the majority of instances by a maneuver consisting of slow extension of the patient's thighs and legs (actively or passively), until both lower extremities were almost parallel with the near edge of the table. This maneuver is accomplished *while the instrument is in the rectum,* just as the distal end is about to enter the rectosigmoid juncture (Fig. 2).

On the basis of experience gained from several hundred examinations, there evolved what I propose to name "the modified, or shoulder-elevated, left lateral position for proctosigmoidoscopy." This may be described as follows: 1. The upper end of an office examining table is elevated 15 to 20 degrees. 2. The patient lies on his left side on the table, about 6 inches (15 cm.) from the proximal edge. 3. The hips are brought toward the examiner so that the left buttock just overhangs the edge of the table. 4. Both thighs are flexed on the abdomen at an angle of 75 to 90 degrees, with the legs and feet near the distal edge of the table. 5. The scope is inserted, and as it reaches the upper part of the rectum or rectosigmoid the thighs and legs are extended (actively or passively) until they are almost parallel with

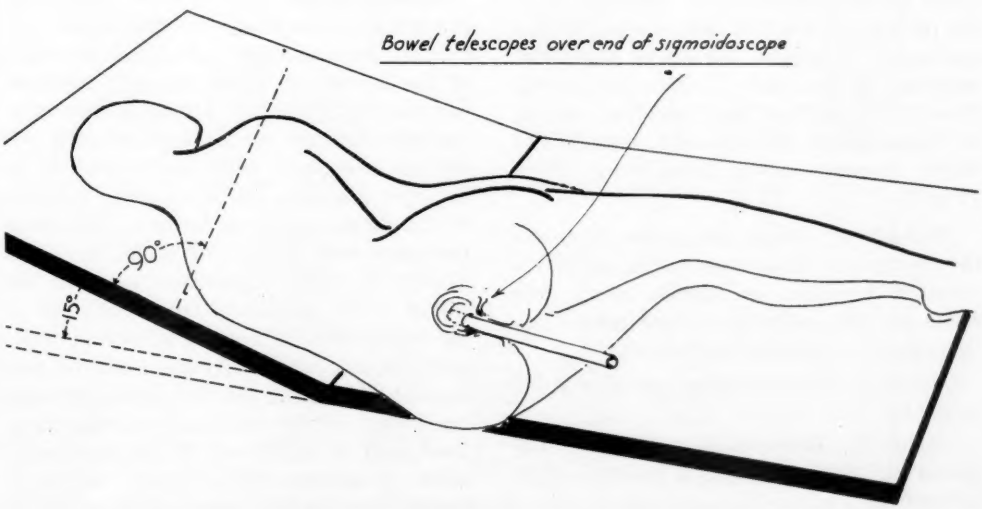

Fig. 3.—Diagram of patient in modified (shoulder elevated) left lateral position.

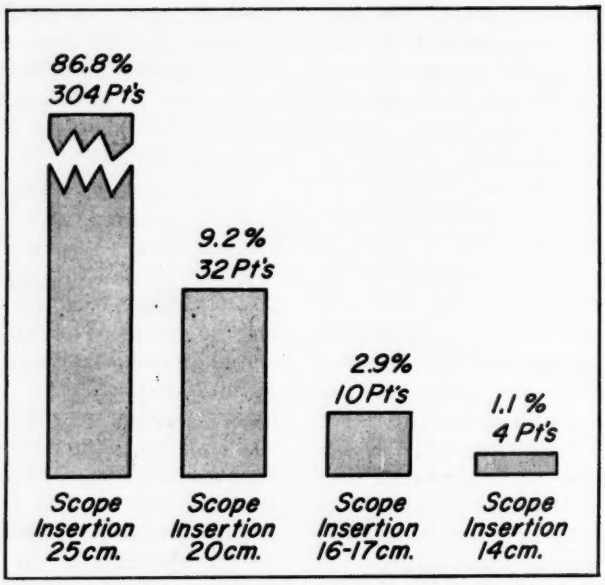

Chart 1 *(Group 1, 350 patients).*—Results obtained with knee-shoulder position.

the edge of the table nearest the examiner. This maneuver allows relatively easy passage of the end of the scope into the low segment of the sigmoid.

Note that this position is the direct opposite of an "upside down" position, with the patient on his left side instead of his abdomen. It allows the lower sigmoidal segment to descend *toward, not away from,* the examiner, and therefore results in visualization of a longer segment of bowel, because of a telescoping effect (Fig. 3).

Methods of Study.—In order to prove the merits and advantages of the shoulder-elevated position, an initial study was made on 623 patients divided into 4 patient-position groups, as follows:

Group 1: Knee-shoulder position (350 patients).

Group II: Knee-shoulder position followed by "flat" left lateral position (197 patients).

Group III: Modified left lateral position (shoulder elevated) followed by knee-shoulder position (92 patients).

Group IV: Modified left lateral position followed by inverted (jackknife) position (30 patients).

Sigmoidoscopic studies were performed in each of these groups to determine, primarily, the maximum possible penetration of the intestinal lumen in each position. Secondarily, the study aimed at determining whether the bowel wall actually did become elongated with the patient in an inverted position, and what effect this had on the displacement of lesions. All examinations were made with a 25 by 2 cm. (10 by ¾ inch) sigmoidoscope. All distances were measured from the edge of the anal verge. When the intestinal lumen and the mucous membrane could be seen distal to the end of the fully inserted scope, the length of the surface seen was measured with a calibrated 30 cm. applicator stick. (Patients with severely painful or obstructive lesions were not included in the study.)

After completion of this study, a similar study, less comprehensive but more revealing, was made. This consisted of tabulation of the distances to which a sigmoidoscope ½ inch (1.25 cm.) in diameter, instead of the larger calibered scope, could be inserted with the patient in the shoulder-elevated position.

Results of Studies.—1. *With the 25 by 2 cm. Sigmoidoscope: Group 1: Knee-Shoulder Position.* Sigmoidoscopic studies were performed on 350 patients in this position. In 304 (86.8 per cent) the instrument was introduced its full length (25 cm.). In 32 (9.2 per cent), the furthest advance was at least 20 but less than 23 cm. In 10 (2.9 per cent), the distance covered was 16 or 17 cm. In 4 (1.1 per cent), the instrument could be passed to but not beyond 14 cm. (Chart 1).

Group 2: Knee-Shoulder Position Followed by "Flat" Left, then Modified Left Lateral Position. One hundred and ninety-seven patients, selected for their willingness and ability to cooperate, were examined first in the knee-shoulder position, and then in the left lateral position. The distances of insertion in the knee-shoulder position were as follows: 25 cm. in 168 patients (85.3 per cent); 21 cm. in 21 patients (10.6 per cent); 19 cm. in 6 patients (3.0 per cent; and 16 cm. in 2 patients (1.0 per cent) (Chart 2, *a*).

After withdrawal of the scope each patient immediately assumed the flat left lateral position, with both thighs flexed on the abdomen. The instrument was reinserted, with the following results: the maximum 25 cm. insertion was possible in only 148 patients (75.1 per cent); 21 cm. was attained in 14 (7.1 per cent); 19 cm. in 6 (3.1 per cent), and 16 cm. in 29 (14.7 per cent) (Chart 2, *b*).

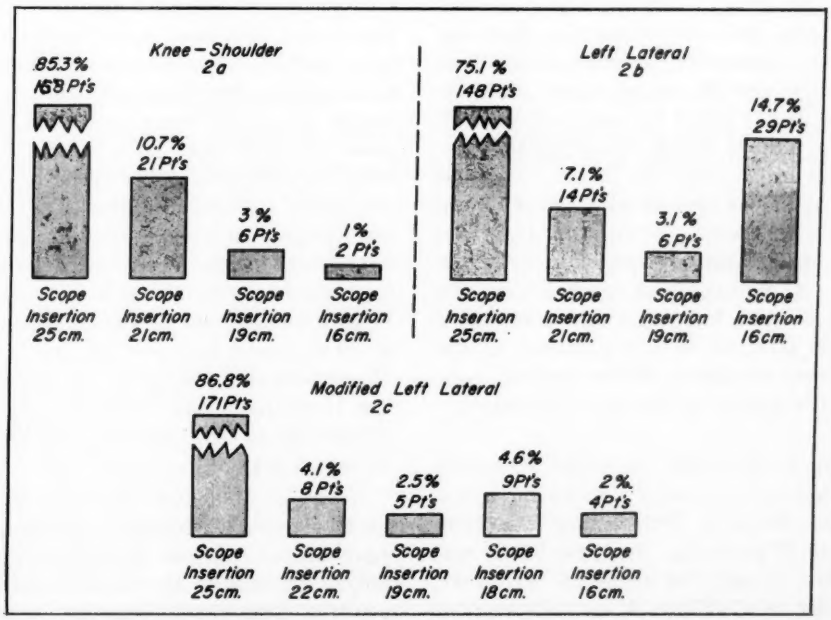

Chart 2 *(Group 2, 197 patients).*—Results obtained with knee-shoulder *(a)* left lateral *(b)* and modified left lateral *(c)* positions.

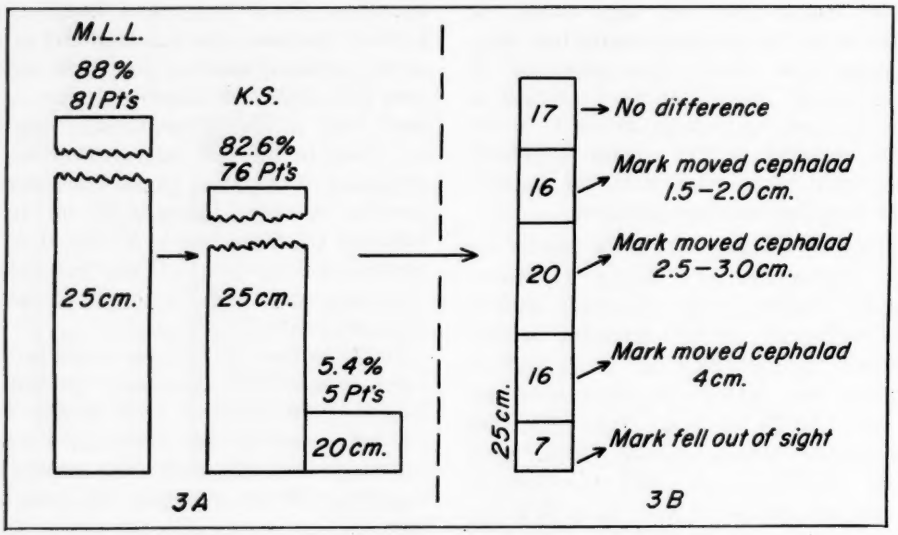

Chart 3 *(Group 3, 92 patients).*—Results obtained with modified left lateral position followed by knee-shoulder.

Next, by simply elevating the head end of the table and employing the thigh-leg extension maneuver, reexamination revealed that the 25 cm. distance could be attained in 171 (86.3 per cent) of the 197 patients (Chart 2, *c*). This figure compares favorably with the 25 cm. insertion in almost 87 per cent of patients in Group 1 and 85 per cent in Group 2, *a*. It is also worth noting that in every case in which the 25 cm. distance was reached with the patient in the knee-shoulder position it was also attained with the patient in the left lateral position. Every patient preferred the lateral to the knee-shoulder position.

Group 3: Modified (Shoulder Elevated) Left Lateral Position Followed by Knee-Shoulder Position. This group was composed of 92 patients. In these 92, it was possible to insert the scope 25 cm. in 81, or 88 per cent (Chart 3, *a*). In each of the 81 patients the level of the distal edge of the scope was marked on the mucosa with a dab of gentian violet or india ink. The scope was then withdrawn; the patient immediately assumed an inverted position (knee-shoulder), and the sigmoidoscopic procedure was repeated. It was observed now that the 25 cm. distance could be attained in only 76 patients (82.6 per cent). More significant, however, is the fact that in 7 patients the 25 cm. mark fell out of sight when the position was changed from left lateral to knee-shoulder; in 16 the mark had moved cephalad 4 cm.; in 20 it moved between 2.5 and 3 cm.; in 16, between 1.5 and 2 cm. In the remaining 17 patients there was no appreciable difference in the position of the mark (Chart 3, *b*).

Group 4: Modified (Shoulder Elevated) Left Lateral Position Followed by Inverted (Jackknife) Position. Thirty patients with polyps detected in the modified left lateral position were reexamined in the inverted (jackknife) position on a flexing table. In every case in which a polyp had been re-

corded between the 14 cm. and the 20 cm. level with the patient in the shoulder-elevated position, the lesion was measured several centimeters further from the anal verge with the patient in the inverted position. Two of four polyps beyond the 20 cm. level could be seen but not reached by the 30 cm. measuring stick; the other 2 fell completely out of sight when the patient assumed the inverted position. Ten lesions below the 14 cm. level in the lateral position, however, showed no measurable difference in position with the patient inverted (Chart 4).

2. *With the 25 by 1.25 cm. (10 by ½ inch) Instrument:* After conclusion of the study with use of a sigmoidoscope of standard (2 cm.) caliber, tabulations were made on 401 consecutive routine procedures with an instrument of smaller caliber (1.25 cm.). The modified (shoulder elevated) left lateral position was used for each examination. The results were highly revealing. In 368 of the 401 patients a distance of 25 cm. (92 per cent) was attained. In 13 additional patients a distance of less than 25 cm. but more than 20 cm. was reached. Thus, in 95 per cent of this series, the sigmoidoscope could be inserted to a maximum or near-maximum distance. Visibility was excellent through this narrower scope, although more careful manipulation was required to inspect the entire circumference of mucous membrane and lumen. It was also possible to electrofulgurate small mucosal lesions and to take biopsy specimens of lesions in many cases.

COMMENT AND CONCLUSIONS

I am not aware of any previously published statistics concerning the relative merits of various patient positions for routine proctosigmoidoscopy. Gant, Gabriel, Yeomans and others have advocated a lateral position for this examination, chiefly because an inverted position is

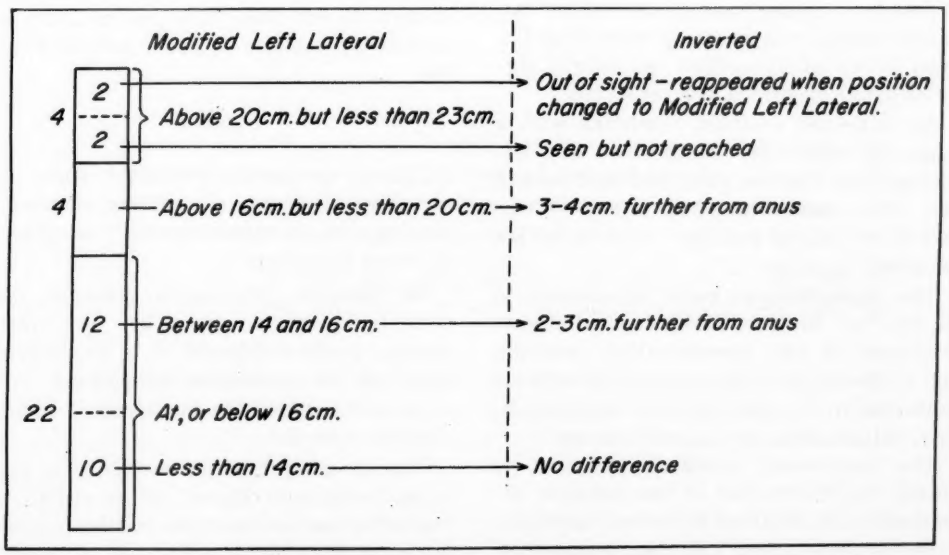

Chart 4 *(Group 4, 30 patients).*—Results obtained wtih modified left lateral position followed by inverted (jack-knife) position.

psychologically and/or physically embarrassing for many patients.

The results of the study here presented disprove the theory that an upside-down position is preferable because it allows the bowel to become elongated and the viscera to be displaced. On the contrary, such stretching of the bowel and the influence of gravity are definite disadvantages, since lesions may fall out of view of the examiner. Is it not obvious that a shoulder-elevated position, by allowing the bowel to descend *toward* the examiner, will result in visualization of a more distal segment of the bowel than with the patient in an inverted position? Shatz and Freitas demonstrated roentgenographically and sigmoidoscopically that "telescoping" of the bowel over the barrel of the instrument could not occur with a patient in an inverted position, owing to longitudinal stretching and flattening of the mucosal surface.

SUMMARY

The distances to which a sigmoidoscope of standard caliber and narrow caliber can be introduced into the distal portion of the colon of an adult patient in several sigmoidoscopic positions are reported.

An improved position, combined with a thigh-leg maneuver, is described and advocated for routine proctosigmoidoscopic use. The name "modified (shoulder elevated) left lateral position" is given to this improved position.

The sigmoidoscope could be inserted to 25 cm. in 85 per cent of all patients examined in the knee-shoulder position, and to 25 cm. in 87 per cent of all patients examined in the modified left lateral position, using a standard sigmoidoscope.

The instrument could be inserted to 25 cm. in 92 per cent of the patients examined in the modified left lateral position, using an instrument 1.25 cm. in diameter.

A sigmoidoscope of narrow caliber, combined with the modified (shoulder elevated) left lateral position, appears to be the ideal combination for routine proctosigmoidoscopic procedures.

RÉSUMÉ

L'auteur indique les distances auxquelles peuvent être introduits les sigmoidoscopes de calibre courant ou de petit calibre, dans la partie distale du colon chez l'adulte, dans diverses positions sigmoïdoscopiques.

Il décrit et recommande une position améliorée combinée avec la manoevre cuisse-jambe, pour les techniques de proctosigmoidoscopie de routine, et donne à cette position améliorée le nom de "position latérale gauche modifiée (élévation de l'épaule)."

Le sigmoidoscope de calibre courant a pu être introduit jusqu'à 25 cm chez 85% de tous les malades examinés dans la position genou-épaule, et jusqu'à 25 cm chez 87% de tous les malades examinés en position latérale gauche modifiée. Un sigmoidoscope de 1.25 cm a pu être introduit jusqu'à 25 cm chez 92% des malades examinés en position latérale gauche modifiée.

RESUMEN

¿Hasta qué altura se puede llegar con un sigmoidoscopio de calibre normal o pequeño, en un sujeto adulto, y adoptando diversas posiciones?

Se describe una nueva posición, que, combinada con la maniobra de muslo-pierna, podía emplearse en la exploración corriente del rectosigma; se la llama "posición lateral izquierda modificada" (con el hombro elevado).

Usando un endoscopio corriente, se pued subir hasta unos 25 cm.: a) en el 85% de los enfermos en posición rodilla-hombro; b) en el 87% de los enfermos en posición lateral izquerda modificada; y si se usa un instrumento de 1,25 cm. de diámetro, en

esta última posición se puede llegar a los 25 cm. en el 92% de los enfermos.

RIASSUNTO

Vengono riferite le distanze raggiungibili dai vari tipi di sigmoidoscopio, normale o sottile, in rapporto all posizione del paziente.

Viene descritta e raccomandata una posizione particolare, associata ad una speciale manovra delle coscie e delle gambe, che prende il nome di "posizione laterale sinistra a spalle rialzate."

Il sigmoidoscopio standard puo' raggiungere i 25 cm nell' 85% dei pazienti esaminati nella consueta posizione genupettorale e la stessa misura nel 87% di quelli esaminati in posizione laterale sinistra; raggiunge, invece, i 25 cm nel 92% dei pazienti esaminati nella posizione laterale sinistra modificata, se si impiega uno strumento di 1,25 cm di diametro.

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Every man naturally persuades himself that he can keep his resolutions, nor is he convinced of his imbecility but by length of time and frequency of experiment. They whom frequent failures have made desperate, cease to form resolutions: and they who are becoming cunning, do not tell them.

If a man does not make new acquaintance as he advances through life, he will soon find himself left alone. A man, sir, should keep his friendship in constant repair.

Marriage is the best state for man in general; and every man is a worse man, in proportion as he is unfit for the married state.

—*Johnson*

Editorials

Beaumont's Belly

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BEAUMONT'S famed belly was not his own, yet he could and did observe it more accurately and fully than he ever could have observed his own. His reports on it brought him international renown not only as a skilled surgeon but, more significantly, as the pioneering physiologic scientist of America.

The belly belonged to a hardy Canadian voyageur, Alexis Bidigan St. Martin, who was born somewhere near Montreal in 1797 and who died at St. Thomas de Juliette on June 24, 1880. Much to the dismay of many scientists over the world, his belly was buried with him. This occurred in spite of William Osler's effort "to pay a fair sum for the stomach . . . to place in the Army Medical Museum in Washington," where of course it belonged. The family of the fistulous St. Martin thought otherwise. They "resisted all requests—most pressing as they were—on the part of the members of the medical profession for an autopsy, and also kept the body at home much longer than usual and during a hot spell of weather, so as to allow decomposition to set in and baffle, as they thought, the doctors of the surrounding country and others."

William Osler reported the deposition of St. Martin's stomach, on which William Beaumont had worked so hard, at a meeting of the St. Louis Medical Society on Oct. 4, 1902. He quoted from a letter from the Honorable Mr. Justice Baby, which described the later years of St. Martin. Without comment Osler included the notation that St. Martin "was rather poor, living on a small, scanty farm in St. Thomas, and very much addicted to drink." Perhaps Osler thought this was a fitting reward for St. Martin's repeated failure to cooperate more fully with the surgeon who had saved his belly, and his life with it, in the studies on that very belly which established modern knowledge of gastric digestion.

Actually St. Martin did cooperate quite well with the dedicated Army surgeon. Beaumont used St. Martin's belly, "the patented digester," in 228 detailed experiments running in four series from August 1825 to November 1833.

The Adventures of Beaumont's Belly.—The fame of Beaumont's belly was the result of an accident. It has been well described by that "indefatigable Beaumontian," Dr. Alfred H. Whittaker of Detroit. The scene was an exciting one on the island called by the Indians "The Turtle," at the junction of Lake Huron and Lake Michigan, now called Mackinac, on June 6, 1822. The Indians and voy-

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ageurs were coming in to trade furs collected from the West. After the long months in the wilderness, the voyageurs were in a mood to drown their thirsts and to feast and fight.

The American Fur Company Store was crowded. A sudden explosion from a gun occurred in the midst of the hubbub. No one knows who fired the shot, but a 19-year-old French Canadian, Alexis St. Martin, who was close to the gun, fell with his belly ripped open and his shirt in flames. Dr. William Beaumont (1785-1853), the Army surgeon at the Fort, who had come recently from Plattsburg, was called and pronounced St. Martin in a hopeless condition. Nonetheless, the surgeon cleaned the wound and applied a dressing.

Beaumont later described the circumstances: The charge of shot "entered posteriorly and in an oblique direction, forward and inward, literally blowing off integuments and muscles the size of a man's hand, fracturing and carrying away the anterior half of the sixth rib and fracturing the fifth, lacerating the lower portion of the left lobe of the lungs, the diaphram, and perforating the stomach."

Beaumont goes on to report: "After cleansing the wound from the charge and other extraneous matter, and replacing the stomach and lungs as far as practicable, I applied the carbonated fermenting poultice, and kept the surrounding parts constantly wet with a lotion of muriate of ammonia and vinegar; and gave internally the Aq. Acet. Am. (ammonium acetate solution) with camphor, in liberal quantities."

Noting that a strong reaction took place, accompanied with fever, Beaumont goes on to describe the sloughing that occurred on the fifth day, with further sloughing on the eleventh day, followed by gradual subsidence of the fever. He notes that "the only way of sustaining him was by means of nutritious injections per anus until compresses and adhesive straps would be applied, so as to retain his food."

Beaumont continued his careful surgical treatment of the wound, with removal of ribs and efforts to close the fistula. Alexis St. Martin refused an operation designed to close the wound. Even after four months, several pieces of shot and wad were extracted from an abscess. Cartilages continued to slough, and even as late as January 1823 Beaumont extracted a cartilage from the opening over the sternum.

By April 1823 Alexis St. Martin was able to walk about and do light work, "enjoying his good appetite and digestion." One year after the accident the injured parts were all sound with the exception "of the aperture in the stomach." The perforation was about 2½ inches (6.2 cm.) in circumference. Beaumont carefully describes the course of healing, noting that the cuticle of the external surface and the mucous membrane of the stomach approached each other very nearly but did not actually unite. It was noted that this condition was the cause of St. Martin's pain or distress.

By the winter of 1824 a small fold of the coats of the stomach appeared, making a valvular formation over the hole in the belly, "so as completely to prevent the efflux of the gastric contents when the stomach was full, but was easily depressed with the finger." It was in May 1825 that Beaumont commenced his first series of experiments on the belly at Fort Mackinac in the Michigan territory. In June Beaumont was ordered to Fort Niagara, New York, but, taking his belly with him, he continued his experiments until August. He later wrote: "Part of these experiments were published in 1826, in the 29th number of the *Philadelphia Medical Recorder*, conducted by Dr. Samuel Calhoun." About this time Beaumont notes that he took St. Martin with him to Burlington,

Vermont, and thence to Plattsburg, New York.

Beaumont plantitively observes that "from the latter place he returned to Canada, his native place, without obtaining my consent." Beaumont goes on to say, "Being unable to ascertain the place of his resort, I gave him up as a lost subject for physiological experiments, and returned to the West again. I did not, however, remit my efforts to obtain information of his place of residence and condition."

Actually Alexis St. Martin remained in Canada four years, during which time he married and became the father of two children. Seemingly he enjoyed health and strength. Beaumont goes on to report, "Accidentally learning about this time where he was, and that he enjoyed perfect health, I made arrangements with the agents of the American Fur Company to annually visit Canada for the purpose of procuring voyageurs, to find and engage in my service, if practicable. After considerable difficulty, and at great expense to me, they succeeded in engaging him, and transported him from lower Canada, with his wife and two children, to me, at Fort Crawford, Prairie du Chien, Upper Mississippi, a distance of nearly 2,000 miles, in August 1829."

Beaumont reports, happily, that his belly was in good condition, with the aperture open. He then undertook a series of 46 experiments, which were continued until March 1831. Beaumont says of St. Martin that "during this time, in the intervals of experimenting, he performed all the duties of a common servant, chopping wood, carrying burthens, so forth, etc., with little or no suffering or inconvenience from his work. He labored constantly, became the father of more children, and enjoyed as good health and vigor as men in general. He subsisted on crude food, in abundant quantities, except when on prescribed diet, for particular experimental purposes, and under special observance."

In the spring of 1831 Beaumont's belly left again. Alexis St. Martin and his family returned to Canada. Beaumont indicates that St. Martin promised to return when required. The family made the tough journey in an open canoe, via the Mississippi, passing by St. Louis, ascending the Ohio River, crossing Ohio to the Lakes and finally reaching Montreal. In November 1832 St. Martin again reported to Beaumont, who had returned to the garrison at Plattsburg. Beaumont took him to Washington, D. C., where, as he reports, "With the facilities afforded by the Head of the Medical Department, the experiments were continued upon him from November 1832 to March 1833."

These experiments in Washington, D. C. were the most extensive of those performed on the famous belly. There were 116 in all, including a series of specific microscopic examinations involving the activity of gastric juice obtained from the belly. The fourth and concluding series of experiments, 62 in all, was carried out in Plattsburg during the summer of 1833.

Each of the total of 228 experiments was carefully detailed. It would seem that Beaumont hoped for further experimental studies, but when St. Martin left, in the first part of November 1833, it was the last that he saw of his noted and well-described belly. Actually St. Martin had signed an article of agreement on Nov. 7, 1833, binding himself for a term of a year to "serve, abide and continue with the said William Beaumont," in return for board and lodging and $150 for the year.

In June 1834 St. Martin wrote that his wife was not willing to let him return. Beaumont continued to correspond with people who lived near St. Martin in Berthier, near Montreal, from 1836 to

1852, but without avail. In 1846 Beaumont sent his son Israel for Alexis, but Israel wrote from Troy, "I have just returned from Montreal but without Alexis. Upon arriving at Berthier, I found that he owned and lived on a farm about 15 miles so.-west of the village."

In spite of offers to take Alexis to Europe and in spite of the considerable sums that were offered, St. Martin refused to leave his home. In 1856 Beaumont's belly was observed by Dr. Francis Guerny Smith of Philadelphia, who reported a brief series of experiments in the *Philadelphia Medical Examiner*.

William Osler reports that St. Martin had to stand a great deal of chaffing about the hole in his side. St. Martin's brother once stabbed a neighbor because of this ridicule. Osler reports also that St. Martin exhibited the wound to physicians, medical students and medical societies. Continuing to report his general interest in the remarkable belly, Osler says that in the spring of 1880, while still living in Montreal, he saw a newspaper notice of St. Martin's death. Osler immediately wrote to the local physician and parish priest, urging them to secure Osler the privilege of an autopsy and offering to pay a fair sum for the stomach, which he agreed to place in the Army Medical Museum in Washington. This offer was refused.

St. Martin was 83 when he died, and his widow survived him by nearly seven years. The Honorable Mr. Justice Baby, who wrote Osler about St. Martin, says that there were many visits between them. St. Martin complained of some doctors who had misused him, but reported that he had made considerable money during his tours. He was described as a tall, lean man with a very dark complexion and a morose disposition.

The Book on the Belly.—While Beaumont was experimenting with his belly in Washington in 1832, his commander, the generous Army Surgeon-General, Joseph Lovell, became interested and urged Beaumont to report his studies. During that spring Beaumont took St. Martin to New York and had sketches made of the wound. A prospectus of a proposed book was issued, and subscribers were sought. Beaumont did not like New York City; there was too much social activity. He asked permission to go back to Plattsburg in order to complete the book. He decided that actually he could have the book printed as well, and perhaps more cheaply, at Plattsburg than in New York or Philadelphia. On December 3 he wrote the Surgeon-General that the book would be ready for distribution in a few days and that a thousand copies would be printed.

The book is an octavo of 280 pages. It was printed by S. P. Allen in Plattsburg. It is dedicated to Joseph Lovell, M.D., Surgeon-General of the United States Army.

The volume is divided into two main portions. The first part deals with preliminary observations on the general physiologic aspects of digestion, as reported by other workers and as generalized by Beaumont: (1) of aliment; (2) of hunger and thirst; (3) of satisfaction and satiety; (4) of mastication, insalivation and deglutition; (5) of digestion by the gastric juice; (6) of the appearance of the villous coat and of the motions of the stomach, and (7) of chylification and use of the bile and pancreatic juice. The second and larger part of the book contains detailed accounts of the four series of experiments. The work concludes with a series of 51 aphoristic "inferences."

The interest of Beaumont's detailed reports is further increased by the inclusion of two large tables (pp. 41-45 and 269-274), indicating the care with which dietary arrangements were followed. The

second table gives the mean time of "chymification" for various articles of diet, both in the stomach milk and *in vitro*, For example, boiled milk was noted to take two hours for digestion in the stomach and four hours and fifteen minutes in a vial. Beaumont says that "the proportion of gastric juice to aliment, in artificial digestion, was generally calculated at one ounce of the former to one drachm of the latter, the bath being kept as near as practicable at the natural temperature, 100 degrees F, with frequent agitation."

The second part of the second table gives the temperature of the stomach taken in different seasons of the year and at various times of the day, either empty or during digestion. Beaumont found that the temperature of the inside of the stomach would range from 98 F in the empty stomach at repose, to 103 F during digestion in connection with exercise.

Background for Beaumont's Belly.—Walter Cannon suggests that Beaumont carried through his work on the belly of Alexis St. Martin with almost no scientific association or background. Actually this was far from the case. Genevieve Miller has clearly shown some of the factors responsible for Beaumont's meticulous scientific work. She has examined his medical notebooks as well as his general notebooks. She indicates the great care with which he made notes on all sorts of medical affairs and the ways in which he continually sought to improve his general cultural background.

Born in Lebanon, Connecticut, on Nov. 21, 1785, Beaumont attended the common school in the village. When he became of age, he went to Champlain, New York, as a village schoolmaster. In 1810 he entered the home of Dr. Benjamin Chandler in St. Albans, Vermont, as a medical apprentice. There he worked for two years and had an opportunity to read the medical texts and conventional classics of the time. He made notes on all. When the War of 1812 broke out he became a surgeon's mate, participated in the expedition to Toronto and was active at the Battle of Plattsburg. He stopped writing in his notebooks in 1813, but after going into private practice in Plattsburg at the end of the war he resumed this work, though he continued it only sporadically.

In 1819 Beaumont was reinstated as an army surgeon and ordered to Fort Mackinac in the Northwest wilderness. On the way he traveled with the Rev. Mr. Jedidiah Morse, a pioneer American geographer and the father of Samuel F. B. Morse. On this trip he made many notes. Within a couple of years his great opportunity came, and he continued his note-taking with care and skill.

Beaumont published a couple of preliminary reports on his study of the great stomach in 1825 and 1826. In his comprehensive report of 1833 he cites some two dozen medical authorities. It is my opinion that Beaumont was really very well prepared for the exceptional studies he then undertook.

Recognition of Beaumont's Researches.—As has been pointed out by Walter J. Meek, distinguished physiologist of the University of Wisconsin, Beaumont's report fully established the scientific basis for dietetics. As George Rosen has demonstrated, the report on Beaumont's belly was received with real enthusiasm by Johannes Muller (1801-1858). Indeed, with his pupil, Theodor Schwann (1810-1882), Muller made the first effort to extend Beaumont's studies, but he was merely able to confirm them. Shortly thereafter, however, Schwan succeeded in extracting pepsin from gastric juice and recognized this as an essential factor in digestion.

Within three years after the appearance of Beaumont's report, German scientists were already confirming his observations,

and British clinicians, as well as French investigators, were becoming interested. Currently there had been a demand for Beaumont's report. In 1834 the volume was reprinted by S. P. Allen in Boston. In 1838, Andrew Combe (1797-1847) issued a reprint from Edinburgh.

Combe states directly that he was so impressed by Beaumont's volume that he "had almost resolved to reprint it entire, both as an act of justice to Doctor Beaumont, and as a valuable contribution to physiological science." He delayed, however, but "finding the interest excited in Doctor Beaumont's experiments increased in proportion as their nature and value became more extensively known. . . . I felt it due to Doctor Beaumont to delay no longer and accordingly republished his work with the addition of various explanatory and practical notes."

This reprint was well received. The important aspects of Beaumont's studies on his belly were indicated as (1) the effect of emotions on gastric secretion; (2) a description of the characteristic appearances of the human stomach, both in health and disease; (3) a description of gastritis and its relation to ingestion of alcohol and to irritation, and (4) stomach changes without exhibiting symptoms in the patient.

The first French recognition of Beaumont came from Nicolas Blondlot (1810-1877), who published in 1843 a volume on digestion. As Professor of Chemistry at Nancy, Blondlot was interested in Beaumont's work and confirmed it. He introduced artificial gastric fistulas in experimental animals, and thus confirmed Beaumont's studies in a strictly experimental manner.

Beaumont's belly won the sincere interest of the greatest of all French physiologists, Claude Bernard (1813-1878). Not only did Bernard refer enthusiastically to Beaumont's studies, but he sought more personal opinions from Beaumont through intermediate correspondents. Bernard himself studied digestion and developed the concept of enzymes. Beaumont's belly subsequently came to be almost taken for granted.

Beaumont's Influence in Russia.—The influence of Beaumont's belly in Russia was significant. In 1841 Professor Basilius Bassow of Moscow reported to the Imperial Society of Naturalists that he had confirmed Beaumont's observations by means of artificial fistulas in experimental animals. Bassow had probably been influenced by the great German physiologist Muller. He published his results in 1843. The first reference to this study was made by the famous I. P. Pavlov (1849-1936) in his summary study *The Work of the Digestive Glands.* Pavlov says: "In the year 1842, the idea occurred to our countryman, Professor Bassow, and in the year 1844, independently to the French physician, Blondlot, to reproduce artificially in animals a similar condition to that observed by an American physician, whose patient suffered from the effects of a gun-shot wound." After discussing the failure of these simple experimental gastric fistulas to show anything more than Beaumont had already observed, Pavlov goes on to describe how he began, in 1889, to advance the study by means of esophageal-gastric fistulas in dogs. This arrangement permitted the observation that stimulation in the mouth might start gastric secretion and motility, without the actual entrance of food into the stomach. Subsequent observations on "sham-feeding" led Pavlov to the recognition of "conditional reflexes" and thus opened the way for many modern neurophysiologic studies. These studies in Russia are still referred to as "viscerocortical" relations. Pavlov's summary study on digestion was published in 1902, and in 1904 he received a Nobel Prize.

It is my firm opinion that Pavlov received inspiration for his studies from his knowledge of the work of Bassow. This probably led him to an examination of the conventional points of view with regard to gastric physiology and thus inspired him to undertake a new program of research with improved technic. I think he recognized clearly the truth of Beaumont's observation that emotions play a significant role in gastric secretion and motility.

Beaumont's Influence in The United States.—Another interesting development from Beaumont's work was the important series of investigations undertaken by Walter B. Cannon (1871-1945). Cannon was born in Prairie du Chien. He must have been aware of the exciting scientific studies of Beaumont at Fort Crawford a half-century earlier. When he was at Harvard, working in the medical school, he was impressed with the discoveries of Wilhelm Conrad Roentgen of Munich (1845-1923), i.e., the visualization of body structure by means of roentgen rays (1895). Using radiopaque solutions introduced into the stomachs of cats, Cannon followed the movements of the stomach and intestines by means of the roentgen rays. He began reporting his results in 1898. Cannon also seems to have been impressed by the influence of emotional behavior on the motility of the stomach. This led him to an extensive study of the relation of endocrine secretion to emotions, a study that culminated in his important book *Bodily Changes in Pain, Hunger, Fear, and Rage.*

One of Walter Cannon's early pupils at Harvard was Walter C. Alvarez, who came for graduate study from Stanford. Alvarez undertook systematic studies of the motion of the stomach and analyzed these movements in detail, reporting his work in 1916. These studies were continued for some twenty years. Again, Alvarez was impressed with the influence of emotions on the movements of the stomach, and summarized his ideas in a famous volume, *Nervousness, Indigestion and Pain.* (Alvarez had published his earlier studies in 1922, in a book entitled *The Mechanics of the Digestive Tract.* This was greatly expanded in a second edition in 1927, and was retitled *An Introduction to Gastroenterology.* The fourth edition in 1948 contains a bibliography of more than 2,000 references.)

In referring to Beaumont, Cannon writes, "His experiments in the frontier fort at Prairie du Chien were conducted with an environment where the very words *scholarship* and *research* would not have been comprehended. Having none of the opportunities for conference and sympathetic discussion with fellow workers; having, indeed, no scientific companions, no library, no journals, no chance of consulting experts in any difficulty, and possessing no laboratory equipment except a thermometer and a few vials, he prosecuted researches on the gastric juice and the gastric digestive processes which had never failed to evoke admiration from all who have read his record. And because he respected 'the true spirit of inquiry' and 'honestly recorded the result of each experiment exactly as it occurred,' his labors, despite the privations he suffered, were fruitful and had influence far beyond the boundaries of his own country, in France, Germany, and Russia."

Another great American physiologist who was profoundly influenced by Beaumont was that stalwart Swede of Chicago, Anton J. Carlson (1875-1956). I do not know how it was that Carlson began his studies on the physiology of the stomach. He had worked at Stanford, but had come East to the University of Chicago and there developed the great Physiology Laboratory of that institution. He began his "Contributions to the Physiology of the Stomach" in 1913, and summarized

them in a general way in a volume entitled *The Control of Hunger in Health and Disease* in 1916.

Certainly, Carlson too must have been impressed by the influence of emotional factors on gastric motility and secretion. Walter Alvarez, in a letter to Carlson dated Jan. 29, 1950, writes: "I can remember how we talked about the possibility of cutting autonomic nerves to the stomach and bowels so that we might do our work in peace. I remember that you said that even you, with your robust build and health, sometimes wished that you could disconnect your digestive tract from the seat of your emotions."

One of Carlson's outstanding pupils was Arno B. Luckhardt (1885-1957). Luckhardt must have been fired by Carlson with enthusiasm for the work of Beaumont. At any rate, it was Luckhardt who went to Green Bay, Wisconsin, and persuaded the heirs of Beaumont, who were living there, to give their treasured mementoes of Beaumont to the University of Chicago. The bulk of Beaumont's notes and records had previously been given to Washington University Medical School, where they formed the basis for the great volume by Jesse S. Myer, *The Life and Letters of Dr. William Beaumont*, which was published, with an introduction by Sir William Osler, in St. Louis in 1912.

Luckhardt succeeded in bringing to the University of Chicago many personal records of Beaumont and his family. These had previously been sought by Professor William Snow Miller (1858-1939), the famed pulmonary histologist at the University of Wisconsin. Miller had been instrumental in promoting the idea of a memorial to Beaumont at Prairie du Chien. He had also written an admirable account of Beaumont, and had hoped to obtain Beaumont memorabilia for the University of Wisconsin Historical Collections. Dr. Luckhardt of Chicago successfully bypassed him.

Another of Carlson's brilliant students was Walter J. Meek, famous physiologist at the University of Wisconsin and my own revered teacher. Meek was a member also of William Snow Miller's great seminar on medical history. Before this group Meek discussed in detail many of the currently significant aspects of Beaumont's brilliant work.

It is certainly clear that Beaumont's dramatic studies on the "patent digester" of Alexis St. Martin, so well devised, conducted, recorded and analyzed, still have wide influence, all over the world. They are continually quoted. In his pregnant observation on the effects of emotions on gastric function, he stimulated the development of what the Russians call "cerebrovisceral relations," and what we call "psychosomatic activities." The impetus from Beaumont's belly continues vigorously in current science.

Concluding Note.—Certainly Beaumont was a careful scientist: his observations were keen, his recording detailed and accurate, his measurements precise and his conclusions justified. Most of what Beaumont observed in the belly of St. Martin has become established textbook routine. Many refinements have been made in measurement of gastric function, but nothing comparable to the overall sweep of Beaumont's research has appeared.

It is quite remarkable that one of the conclusions reached by Beaumont, that emotional or mental disturbances affect gastric motility and secretion, should have had such wide influence in stimulating significant research on psychophysiology. This has been particularly exemplified in the work of Pavlov, Cannon and Alvarez. Currently it is interesting to note a report by Professor N. Rashevsky of the University of Chicago and Editor of the *Bulletin of Mathematical Biophysics*, that he is

studying the mathematical analysis of the influence of emotions on gastric function!

Beaumont's brilliant research was made possible by his surgical skill in repairing the shattered abdomen and stomach of Alexis St. Martin. Primarily Beaumont was a surgeon. After his long career as a military surgeon, he practiced medicine, with special regard for surgery, in St. Louis until his death in 1853. In connection with the several medical schools founded in those pioneer days in St. Louis, Beaumont probably taught surgery also. It is therefore appropriate and fitting in every way that the International College of Surgeons, in its magnificent headquarters in Chicago, should dedicate a room and a portrait to William Beaumont.

Beaumont was a great pioneer surgeon, who saw the opportunity for extended physiologic study in connection with his surgical skill and whose reputation as a pioneering physiologist was recognized by scientists and surgeons all over the world.

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If we take the trouble to work out an idea which looked like a deep discovery when it occurred to us, we often find it a hackneyed truth.

—*Vauvenargues*

Egas Moniz

Founder of Psychosurgery, Creator of Angiography, Nobel Prize Winner 1874-1958

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What gives man lasting significance is not the accumulation he leaves, but rather the activity and zest that permeates his life and passes itself on to others.

—Goethe

I was always dominated by the desire to reach something new in the scientific world. Persistence, which depends more on will-power than intelligence, can overcome difficulties which seem at first unconquerable. Cajal already called it the virtue of the modest.

—Egas Moniz

ON THE thirteenth day of December 1958, Egas Moniz died in the Portuguese capital, where he had worked with the energy of a prodigious talent, and he has since become known throughout the world. He was founder of the science of psychosurgery, creator of cerebral angiography and winner of the Nobel Prize in the fields of medicine and physiology (1949). He was a man of indefatigable perseverance in the search for truth. He was not only a medical genius and a talented mathematician but an impartial literary critic, well versed in history and diplomacy, clever and prudent in politics and sensitive and erudite in the analysis of painting, poetry and sculpture. It may be said that all lights shone in the many facets of his intelligence.

Biographic Notes.—Antonio Caetano de Abreu Freire Egas Moniz was born in Avanca, a village lying forty kilometers from Oporto, Portugal, on November 29, 1874. At the age of 5 he was taken to Pardilho, where an uncle taught him to read. Life in both villages later influenced him greatly. Seabra Dennis has written of him: "There is no doubt that his native land and the simple and pacific life of the country people influenced him indelibly to such a point that during all his life the vision of this village was like an irresistable magnetic pole." He built the Casa de Marinheiro there, in which he spent most of his holidays close to nature and far from intellectual work. There he could devote himself temporarily to his esthetic and artistic avocations. Inspired by them, he wrote an operetta entitled *A Nossa Aldeia*, which was presented in 1920.

Student and Physician.—Between the influences of the Pardilho village and the old University of Coimbra, the intellectual life of Egas Moniz developed in the School of S. Fidel and the Lyceum of Viseu. In 1891 he entered the University of Coimbra, where he studied until 1911. Between his sixteenth and his thirty-seventh year he lived in the cloisters of Coimbra, and his intellectual life there had a pronounced

From the Neurosurgical Clinic, Medical School, University of Buenos Aires.

influence on his personality, as may be seen in the progress of his spiritual attitude *(Un Ano de Politica, 1920)*. He finished his medical career in 1899 and, after three years, undertook advanced study at the University of Coimbra.

Before beginning his studies at the university, Egas Moniz had hesitated between medicine and engineering. He took a preparatory course in medicine, therefore, and one in integral and differential calculus.

A regulation prevented him from continuing his studies in engineering. He then decided to devote himself to medicine, though he never lost his affection for mathematics. He and a fellow-student published an essay on algebra, and he dedicated himself to the private teaching of mathematics.

This is just a glimpse of the singular intellectual activities of Egas Moniz, which were described by a fellow-student at the University of Coimbra in the following words: "Gifted with a spirit of prodigious agility, he ardently lived an intense life, had time for everything and knew it all well. He did not limit his activities to medicine but extended his interest and energy to other things—art, philosophy, the reading of romances, etc."[1] His disciples elected him president of the Academia Tuna, a scholastic organization of great prestige. To become its president was a distinction, because the students, with perfect loyalty and impartial judgment, elected to that position the most gifted among them. The subsequent life and career of such a student usually justified the school's decision, and so it was with Egas Moniz.[2]

Neurologist.—After Egas Moniz' graduation another doubt assailed him. He knew he must decide which specialized studies would best suit him permanently. By his own account he decided in favor of neurology and ophthalmology, perhaps because, at that time, it was a custom in Portugal for teachers of clinical medicine to ask upperclassmen to examine and handle neurotic patients. This task fell to Egas Moniz. It permitted him to observe "a vast world of possibilities which stretched before his adolescent eyes, avid with scientific aspirations."[1] He became acquainted with the names of Charcot, Pierre Marie, Babinski, Déjerine and others, the high priests of neurology and psychiatry at the beginning of the twentieth century.

Fig. 1.—Portrait and autograph of Egas Moniz.

Influence of French Neurology.—Egas Moniz identified himself with the French spirit and the French neurologic discipline to such an extent that his neurologic

education, he proudly confessed, was "nearly all French."[2]

In 1902 he traveled to Bordeaux to improve his knowledge of neurology by studying with Pitres. Later he worked with Regis on the problem of toxic psychosis, ratifying his opinion concerning organic factors in the etiopathogenesis of mental disease, an experience that finally crystallized in the creation of psychosurgery. He then went to Paris, where he studied neurology at La Salpetriére with Raymond, Pierre Marie and Déjerine, and was especially aided by his studies with Babinski at La Pitie. The greatest benefit of those years was the friendship of these masters and their collaborators. In 1931 Babinski praised Egas Moniz' work with great enthusiasm, recommending it to the attention of all neurologists in his *Diagnostic des Tumeurs Cerebrales et Epreuve de la Encephalografie Arterielle* and adding this quotation from Paul Valery: "As a result of long meditation and many experiments, managed by an exact method, the practical data were obtained."[3]

It is easy to understand, in view of the similarities in interest and temperament of the two men, that Egas Moniz' most intimate friend among all the French neurologists was Sicard, the inventor of micrography and an innovator in the surgical treatment of epiduritis. An episode, yesterday anecdotal and today historic, found two singular spirits joined in friendship and in the practice of neurologic science. One day Egas Moniz arrived in Paris to pay a visit to his friend Sicard at the Necker Hospital. As usual, he found him surrounded by physicians from all countries, describing to them a patient with a cerebral tumor and pointing out clinical limitations and the need of an endocranial semiologic method of diagnosis, such as the use of lipiodol in the spine, in order to facilitate neurosurgical operations. Noting the arrival of Egas Moniz, he asked, "Can *you* bring us something new to localize cerebral tumors?"

Egas Moniz, touched but confused, waited until his friend had finished and then showed him the arteriogram in which an upward displacement of the sylvian artery by a temporal tumor, later histologically verified, had been first observed. Hours later he delivered an address to the Société de Neurologie and introduced the new diagnostic technic, which, like many other discoveries of genius, was forced to await the statistical confirmation of further research.

On March 3, 1936, Egas Moniz presented a paper at the Académie de Médicine de Paris, entitled *Essai d'un traitement chirugical de certaines psychoses.* This was his first publication, which led to the work, *Tentatives operatoires dans le traitement de certaines psychoses.*[5]

Teacher.—In 1911, when the professorship in neurology was created at the University of Lisbon, Egas Moniz went from Coimbra to the Portuguese capital, where he remained a member of the Faculty of Medicine until 1945, the year he retired. Several times he combined his teaching tasks with those of the dean. With Flores,

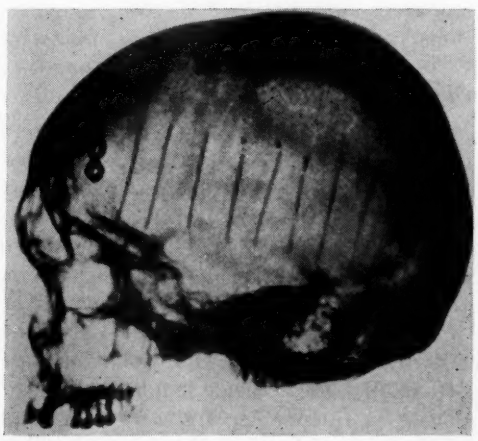

Fig. 2.—Test for determination of opacity of 10 to 80 per cent solutions of Stroncian bromide.

a disciple of O. Vogt, he founded the Neurologic Clinic of the Hospital of Santa Marta. In 1900 he published the nineteenth edition of *Sexual Life: Physiology and Pathology.* In 1917 he recounted, in the monograph *Neurologia da guerra,* the progress that had been made up to that time. In 1921 he became interested in lethargic encephalitis, and in 1925, in commemoration of the first century of the Royal School of Surgery of Lisbon, under the sponsorship of the Faculty of Medicine, he published *Clinica Neurologica.*

The year 1926 was of the utmost importance in the life and works of Egas Moniz, for at the age of fifty-one, he became interested in making roentgenographic images of the cerebral arteries. One year later he published his first conclusions, which appeared more formally in the books he published in 1931, 1934, 1938 and 1940, in French, Italian and German editions, the German edition being partly the work of Bumke and Foerster. Scarcely two years after his first publication there appeared in Argentina another one, entitled *Encefalografia Arterial: Aproposito de las inyecciones carotideas (Rev. Otol. Neurol. Oftal. y de Clin. Neurol.* 4:276, 1929), and three years later, in the same journal, a work entitled *New Aspects of Cerebral Angiography.*

Publisher, Critic, Historian.—Egas Moniz shows himself to be a writer, historian and art critic in the work *Julio Diniz e a Sua Obra,* in which he analyzed the work of the Portuguese physician and writer. In *O Papa Portugues João XXI, Os medicos no teatro Vicentino, ao mestre José Malhoa,* and a sentimental tribute, *Do valor e da saudade,* he asserted his love for the world in which he was born. In 1949 he published his *Confidences of a Scientific Investigator,* in which he tells of the different periods of his long and productive life, the hesitancy he often felt in pressing for the attainment of his

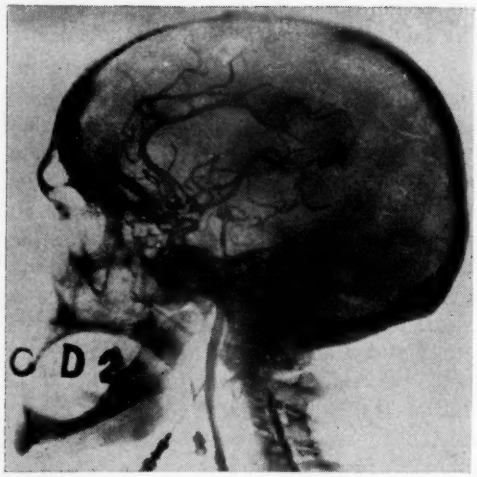

Fig. 3.—Visualization of cadveric arterial network, with use of 30 per cent I. Na. solution.

desires, the joy of his successes and the pain of his temporary failures.

He held in great admiration the life and works of Ramon y Cajal, to whom de dedicated two conferences at the Academy of Sciences in Lisbon *(Uma doctrina e uma epoca).* Percival Bailey found in the two men a suggestive similarity when he compared them, saying "It is true that great things are made with insufficient resources and under unfavorable conditions. See the work of Cajal in Spain and Egas Moniz in Portugal. The genius overrides the circumstances."

Distinctions.—In all the fields in which he was engaged, Egas Moniz was honored with the highest distinctions in the gift of scientific societies, both in his own country and abroad. He was an effective member of the Academia das Ciencias de Lisbon and later its president; a member of the Société de Neurologie de Paris, the Société de Oto-Neuro-Ophthalmologie of Strasbourg, the Neurology and Psychiatry Society of Buenos Aires, the Royal Society of Medicine of London, the Academia Brasileira, the Spanish Association of Medical

Writers and the Neurologic Society of Buenos Aires. He was made a Doctor Honoris Causa of the Universities of Bordeaux and Lyon and a Knight of the Legion of Honor. These and other distinctions were crowned with the Nobel Prize for Medicine and Physiology, an honor he shared with Hess in 1949.

The Human Side.—Egas Moniz was sensitive to all the aspects of human life. Wherever and however he lived, he lived intensely. His discussion with Henry Babinski, brother of the great neurologist, about the most favorable place for brandy or port wine is memorable. When someone started a study trip, he would recommend with equal authority that they go to the source of instruction, known by him through information and knowledge gained and the joy of the "ortolans" and the "chapon fins." He greatly enjoyed a game of cards on Friday night, and his knowledge of the subject is evident if one reads his introduction to *The History of Playing Cards.* He grew interested in sculpture and became dedicated to the protection of artists (Maurice of Almeida, *Sculpture,* 1943).

Politician and Diplomat.—The motives that guided Egas Moniz' life were provided by his family and environment and by his convictions, and his idea of culture caused him to be far from realistic. His political ideas tended toward a liberalism that was novel in Portugal at the time, particularly at Coimbra University with the generation that adhered to "natural scientific conception."[1]

Fig. 4.—First arteriogram taken of patient with cerebral tumor (adenoma of hypophysis).[4]

He created and directed the Centrist Party. A deputy for the Progressive Party, a republican, a frustrated revolutionary and a political prisoner, he summarized in *Un ano de politica* his experience in this unfamiliar field. He commanded the Portuguese Legion in Madrid and was Minister of Foreign Affairs, representing his country in the Peace Conference in Paris in 1918. He retired from political life in 1918.

His home on Fifth of October Avenue reflected the sensibility of its occupant. He was nearly killed by bullets fired by a schizophrenic assassin, and while his disciples tried to save his life he kept insisting that his assailant was not a murderer but a sick man.

In spite of a disease that obliged him to limit his physical activities, his scientific work and his spiritual life and character remained vigorous and clear during the years of his glorious and fruitful old age.

I had the privilege of meeting and talking with him in Lisbon at the end of October 1952. He was cordial and amiable. At that time he was interested in Argentine and South American medical and surgical neuropsychiatry, which he knew thoroughly from a study of its publications. He spoke with great enthusiasm about the future of psychosurgery and angiography. He explained that, being troubled with gout, he had not gone to the third Latin American Congress of Surgery, which had taken place in Buenos Aires in 1949. And while he showed us, without bitterness or regret, his deformed joints, we thought

that, like Dufy, he was a man whose genius transcended physical limitations.

Contributions of the Portuguese School to Neuropsychiatry.—The life and work of Egas Moniz revealed, from the time of his first interest in medicine to his fruitful old age, the clearness of his understanding, the scope of his genius and the harmonious equilibrium between his clinical power and his creative sagacity. More than 300 publications reflect his productivity. Special mention must be made of his contributions to cerebral angiography, among them the establishment of carotid thrombosis as a nosographic entity. His contributions to psychosurgery, which began with prefrontal leukotomy, continued and increased to a long sequence of surgical tactics and technics.

Cerebral Angiography.—"We have conquered a little of the unknown, the supreme aspiration of men who work and fight in the field of research." Egas Moniz considered cerebral angiographic study a necessity, because of the limitations of clinical and complementary means of diagnosing cerebral tumors. He began his investigations using the gaseous medium of Dandy, the oily medium of Jacoboeus and Schuster and the colored medium of Martel. He examined the contributions of Purves, Stewart, Elsberg, and Sittler and Jungling. He agreed with Sargent (1924) about "the potential danger of the introduction of air into the ventricular cavities and the difficulty of interpretation of the roentgenograms."[6] Roentgen visualization of the subarachnoid spinal medullary space, created by his friend Sicard for the gallbladder on the basis of work by Graham, Cole and Copher, whom Egas Moniz cites, convinced him that he could obtain visualization of the cerebral vessels.

Angiography itself was the final difficulty in a series of difficulties that Egas Moniz finally overcame by titanic effort. His disciples and biographers narrate the way in which he carried in his car the heads of cadavers from the Institute of Anatomy, where they were prepared, to the Clinic of Santa Marta, where they were used for roentgenographic trial studies. He had that simple and genial spirit, illuminated by clarity and objectivity and amenable to criticism, that also distinguished Dandy, Sicard and Balado.

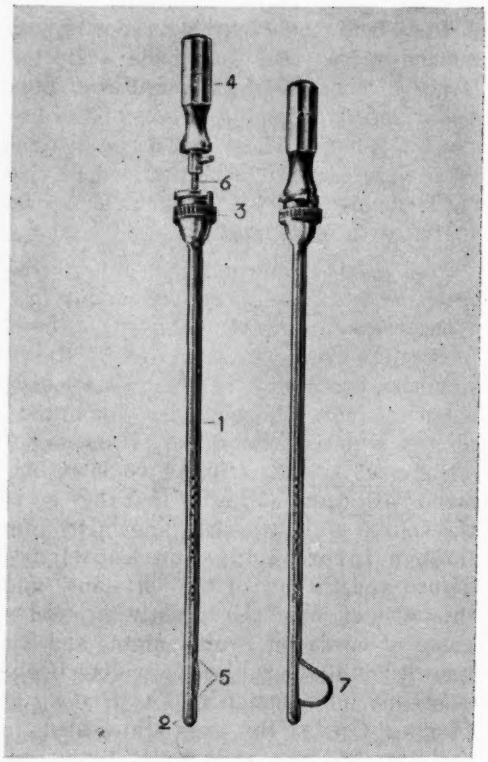

Fig. 5.—Cerebral leukotome showing (1) cannula; (2) blunt end; (3) upper end, open to allow entrance of leukotome (4); (5) opening 1 cm. long and 1 mm. wide for passing wire (6) in form of loop (7) 5 mm. at widest dimension, which cuts spheroid sections from oval center. (See Figure 7.)

He searched for a medium that (1) would be opaque to roentgen rays; (2) would not be oily; (3) would pass through the capillaries, thus preventing embolism; (4) would be harmless, and (5) would not become diluted in the bloodstream.

Working from a physiologic standpoint, he recalled that, of 160 cc. at each systole, 3 to 4 cc. should pass in and through the carotid. A radiopaque substance would thus be dissolved in 20 cc. of blood, which would make the liquid introduced invisible. Basing his work on therapeutic knowledge and other medical considerations, he began by using bromide of estroncium and lithium and afterward used iodides. He experimented with animals, making use first of the rabbit and of the dog, and used cadavers to obtain a "map" of the normal circulatory system. He waited for six months to observe the arteries in the cadaver of a patient who had had a cerebral tumor. Only thereafter did he begin work on living human beings. He recounted frankly the failures of his first trials: probable puncture of the internal jugular vein, inability to obtain the collaboration of the patient and the lack of a technical method ideal from the roentgenographic point of view. He stated that "the third patient of the iodine series, a boy 20 years of age having a hypophysis tumor, blind, and with a Babinski-Frölich syndrome, was in dangerous condition. Five cc. of a solution of 25 per cent INA was injected and caused no suffering, except for slight dysphagia." Like the melancholic, anxious paranoid patient on whom he performed the first psychosurgical operation, this youth became one of the legion of anonymous heroes of medical progress.

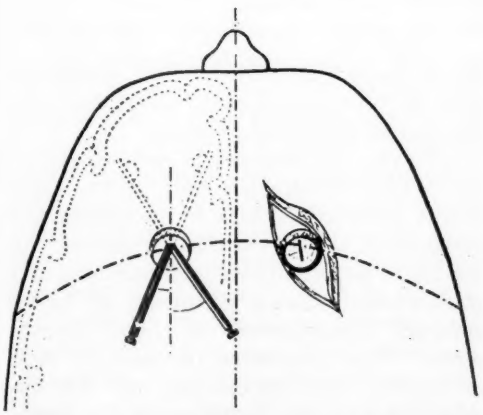

Fig. 6.—Incision of soft tissues, trephine orifice and direction taken by leukotome on insertion.

He got a glimpse of the carotid, which was pushed forward and had no superior curve. The sylvan artery was clearly visible, also pushed forward and upward. The anterior lobe of the cerebrum showed a different disposition from that normally observed; it looked very thin and cloudy (Fig. 4). "The tumor," he stated, "is the cause of the alteration of the disposition of the internal carotid and the sylvan arteries, and probably of the modifications of the anterior cerebral, but on this last point we are not able to give a definite opinion. It was revealed by making a comparison between these and normal roentgen pictures." With prudent and prophetic authority he concluded, "The demonstration of our thesis has been made. One can obtain in a human being a radioarteriograph of the brain, and it can provide elements that will enable us to localize the tumor. It is only necessary to continue the experiments to obtain the information that one case cannot give us."

At the conclusion of this session, on July 7, 1927, Babinski foresaw that "if the subsequent observations definitely confirm that the injections that Egas Moniz has used are harmless, all neurologists should be thankful to their great colleague, who has given them a new method of localizing brain tumors, which are sometimes very difficult to delimit." Souques[8] congratulated him for "his extremely interesting communication," and his friend Sicard[9] proclaimed the "discovery of a new method of vascular-cerebral investigation in the living which should probably be fertile in practical results, especially in localizing brain tumors."

Psychosurgery.—O. Fontecilla wrote:

Fig. 7.—*A*, sections of brain taken 3.5 and 4.8 cm. from cortex (Dejerine). Concentric circles represent places from which sections were taken. *B*, distribution "at an angle" of sclerosing injections of alcohol in center.

"Our mission is to cure the sick. If von Jauregg had only studied general paralysis without producing malaria, we might now have known something more about it, but we would still be unable to cure a patient with general paralysis." Egas Moniz, writing to Barahona Hernandez[10] in 1935, said: "You, the psychiatrists, lose yourselves in the dark forest of logic and psychopathology, and now and then even make incursions into the metaphysical. Only Kleist occupies a clear and concrete position in psychiatry, as I understand it: knowledge of the organ and exact study of the brain." He added, "I am convinced that only through organic orientation can psychiatry make real progress."

Like the astronomer who sees constellations when others see only stars, Egas Moniz grasped the idea by observing the temporary improvement produced by Dandy in potentially suicidal paranoid and melancholic patients by means of lobectomized meningiomas of both frontal lobes. "More alterative in quantity than in quality," was his opinion, and this applied also to the indifference of Becky and Lucy, the chimpanzies leukotomized

by Fulton and Jacobsen as a means of studying the reaction before proceeding to labyrinthine excitation.

From the Second International Congress of Neurology in London in 1955, Egas Moniz returned to Lisbon with a plan of work which he placed in the clever hands of his neurosurgeon, Almeida Lima, who had returned to Portugal after his training in the London Hospital under the direction of Cairns. They initiated, on November 12 of that same year, a line of investigation that later became doctrine. In this way psychosurgery, already foreseen by Burckhart, was born:

Barahona Fernandez[10] pointed out that Egas Moniz, owing to his positivist conception, his dynamic personality and his capacity for work, suffered because of the negligible effects of therapy for the correction of nervous conditions. Thus prefrontal leukotomy, the first psychosurgical operation and the precursor of those to follow, emerged as a responsible and conscientious, if startling, surgical innovation. Its creator was fully aware that the generous and positive hope on which it was based would be misunderstood and misinterpreted by the confused and skeptical medical minds of his contemporaries, as is revealed by an excerpt from his own work:[5] "Scientific research in the clinical field is often very difficult because into it go the lives of patients, which have for us, the doctors, the greatest value. We must meditate much before making trials that could be harmful to these patients. All circumstances must be appreciated." He compared the semiologic and therapeutic benefits of animal research and pointed out the impossibility of making comparative psychologic studies, since it is impossible to arrive at definite conclusions. "There is such great difference between the psychologic lives of men and those of beasts, even those most elevated in the zoologic scale, that elements of comparison can exist only in a very limited degree and may be observed in connection with only the most elemental psychologic reactions."

Prudently, he asked for the collaboration of a psychiatrist, e.g., Sobral Cid, of a clinician with neurologic experience, e.g., Caucela de Abreu, of a neurosurgeon, Almeida Lima, and of a psychiatrist and severe critic, Barahona Fernandez, who at that time had a scholarship with Kleist. He thought that, as with neurosurgery, in which "the diseases called functional have disappeared successively," this would occur in psychiatry when organic study had made real progress. He proclaimed it as an essential principle that the psychic life is a functional manifestation of the nervous system *en masse*, and he explained psychic phenomena as due chiefly to the interdependence of the cerebral cells and the multiple links between them. "The cellular elements of the brain control both psychic and physical life. This question, which has been much discussed since the earliest days of philosophy, depends on a sequence of phenomena completely similar to those observed in psychic life." Here he deviated from the judgment of the "established group" in that he explained himself by using the neurobiotaxic theory of Ariens Kappers, in this way: "To be able to cure patients [here he refers to psychotic patients] it is necessary to destroy the connective links between the cells, and among the more important ones we consider those connected with the frontal lobes." Responsible, and conscious of his human limitations of judgment, he agreed that[4] this was "only a hypothesis, the initiation of a new method of treatment for certain kinds of psychosis. If it is to be continued, there will be a long program to fulfil." His first statistical report, based upon his experience with 20 patients, presented the following results: "None dead; none became worse after the opera-

tion." The overall results were: 35 per cent were clinically cured; 35 per cent showed improvement, and in 30 per cent there were no results.[4] In addition to his theoretic concepts, he and Almeida Lima devised instruments adequate to the procedure (Fig. 5) and illustrated the anatomic bases (Figs. 6, 7 and 8) for his previously mentioned theories. Even today his contributions are accepted as a basis for new hypetheses and are frequently the principal subjects of Congress discussion.

After his first enthusiasm had passed, he estimated the possibilities that his research might "open up" in time and announced hopefully: "All the attempts made to increase the possibilities of curing the psychotic deserve the kind attention of all those who consecrate themselves to the thankless and difficult mission of treating the insane."

Egas Moniz foresaw the criticism and quarreling and believed that his theories would not be accepted until at least fifty years later. In this he was mistaken, for the seed he had planted bore fruit, and he saw and enjoyed, during his lifetime, assistance given to schemes derived from his ideas. The flattering Nobel Prize was awarded him in 1949. The Brazilians took the initiative at the Congress of Lisbon in 1948, with the unanimous support of literary controversial and investigative discussions all over the world, among them the Third South American Congress of Neurosurgery at Buenos Aires in 1949. This was the basis upon which the Carolino Institute of Stockholm proposed him as worthy of so high a distinction.

> "In the olden times there were altars for the forgotten gods. Consecrate part of your soul to the unknown future."
>
> —*José E. Rodo*

Cerebral angiography and psychosurgery are now an important part of neurosurgical research. The possibility of curing psychoses, relieving pain, mitigating affliction and anxiety and annulling aggressions offers many formerly hopeless patients the hope of reeducation and readjustment. Moreover, objective knowledge of anatomic and functional interrelations has greatly increased, and much better results can be expected in the future. Also, cerebral angiography, as stated in the special edition of *El Dia Medico*, twenty-seventh Anniversary (p. 104), has contributed substantially to the solution of two major neurosurgical problems, the degree of extension and the operability of tumors and their early diagnosis, by a method superior to those used in the past, especially with regard to glioma. David affirmed that we are "in an impasse resulting, as usual, from the lack of harmony that accompanies the evolution of any new and different technic." One must agree with this illustrious French neurosurgeon when he says that "the complexity of problems brought to our attention by roentgen exploration in neurosurgery proves the absolute necessity for progress toward the strict coordination that will permit intimate union and a better understanding between the different classes of investigators in better adapted centers."

The name of Egas Moniz has been permanently incorporated into the history of medicine and is venerated by medical men because of three important contributions he made to surgical progress. First, he introduced psychosurgery, not only as a therapeutic measure but as a fertile source of research concerning the functions of the brain, many of which, even today, are only imperfectly understood. Second, he introduced angiographic study, always helpful and sometimes without an adequate substitute, an inspired diagnostic aid which, like psychosurgery, presents more philosophic than medical problems. Third, he taught an important and valuable lesson in perseverance in scientific work and

investigation. His devotion to the search for truth cannot be questioned. His life and work convey a clear and unmistakable message; and, as Artemio Zeno has stated, "The message of liberation is a message of construction."

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The hardening and separation of the individual in the course of the fight for freedom has been inevitable, and is not likely ever to be wholly undone. What is necessary, if an organic society is to grow up, is that our institutions should be so fundamentally changed as to embody that new respect for the individual and his rights which modern feeling demands. The medieval Empire and Church swept away the individual. There were heretics, but they were massacred relentlessly, without any of the qualms aroused by later persecutions.

What is needed is a unifying or integration first of our individual lives, then of the life of the community and of the world, without sacrifice of individuality.

It is the individual in whom all that is good must be realized, and the free growth of the individual must be the supreme end of a political system which is to re-fashion the world.

—*Russell*

New Books

BOOKS RECEIVED

The following books have been received by the Editor; they will be reviewed critically as space and facilities permit. Omission of more extended review, however, is not to be taken as criticism of the merit of the book.

Surgical Errors and Safeguards. By Max Thorek. Philadelphia: The J. B. Lippincott Company, 1960. 5th ed. Pp. 682, with 455 illustrations, many in color. *Reviewed in this issue.*

Clinical Neurosurgery, Volume 7: Proceedings of the Congress of Neurological Surgeons, Miami Beach, Florida, 1959. Edited by Robert G. Fisher. Baltimore: Williams and Wilkins Company, 1961. Pp. 278, with 114 illustrations. *Reviewed in this issue.*

Chemistry of Digestive Diseases. By John R. Gamble and Dwight L. Wilbur. Springfield, Ill.: Charles C Thomas, publisher, 1961. Pp. 120. *Reviewed in this issue.*

The Chemistry of Brain Metabolism in Health and Disease. By J. H. Quastel and David M. J. Quastel. Springfield, Illinois: Charles C Thomas, publisher, 1961. Pp. 169, with 30 tables and illustrations. *Reviewed in this issue.*

Orthopaedia. By Nicolas Andry, Philadelphia: The J. B. Lippincott Company, 1961. *Reviewed in this issue.*

Les Cavités Cardiaques: Introduction Anatomique a la Chirurgie Intracardiaque (The Chambers of the Heart: An Anatomic Introduction to Intracardiac Surgery). By E. Henry, R. Courbier and P. Rochu, with a preface by R. de Venrijoul. Paris: Masson et Cie., 1960. Pp. 176, with 196 illustrations.

A Clinical Prospect of the Cancer Problem (Introductory volume of **Monographs on Neoplastic Disease at Various Sites).** By D. W. Smithers. Baltimore: The Williams and Wilkins Company, 1960. Pp. 232, with 46 illustrations and 10 tables.

Thymectomy for Myasthenia Gravis. By Henry R. Viets and Robert S. Schwab. Springfield, Ill.: Charles C Thomas, Publisher, 1960. Pp. 130, with 32 illustrations.

Experiences with Congenital Biliary Atresia. By Julian A. Sterling. Springfield, Ill.: Charles C Thomas, Publisher, 1960. Pp. 68, with 21 illustrations.

Clinical Gastroenterology. By F. Avery-Jones and J. W. F. Gummer. Springfield, Ill.: Charles C Thomas, Publisher, 1960. Pp. 652. *Reviewed in this issue.*

The Femoral Neck—Function, Fracture Mechanism, Internal Fixation: An Experimental Study. By Victor H. Frankel, Springfield, Ill.: Charles C Thomas, Publisher, 1960. Pp. 119, with 58 illustrations.

Congenital Malformations: A Ciba Foundation Symposium. Edited by G. E. W. Wolstenholme and C. M. O'Connor. Boston: Little, Brown and Company, 1960. Pp. 308, with 91 illustrations.

General Anesthesia for Neurosurgery. By Robert I. W. Ballantine. Boston: Little, Brown and Company, 1960. Pp. 152, with 68 illustrations.

Experiences with Congenital Biliary Atresia. By Julian A. Sterling. Springfield, Ill.: Charles C Thomas, Publisher, 1960. Pp. 68, with 21 illustrations.

Calcium Metabolism and the Bone. By Paul Fourman. Springfield, Ill.: Charles C Thomas, Publisher, 1960. Pp. 325, with 7 illustrations.

Chemical Osteosynthesis in Orthopaedic Surgery. By Michael P. Mandarino. Springfield, Ill.: Charles C Thomas, Publisher, 1960. Pp. 72, with 36 illustrations.

BOOKS REVIEWED

Surgical Errors and Safeguards. By Max Thorek. Philadelphia: The J. B. Lippincott Company, 1960. 5th ed. Pp. 682, with 455 illustrations, many in color.

First published in 1932, *Surgical Errors and Safeguards* had gone through four editions by 1943. The present fifth edition reflects the changes in surgical practice in the seventeen momentous and fruitful years that have elapsed since publication of the fourth edition.

From the beginning, the volume has been acclaimed for its detailed information concerning common and uncommon errors in surgical practice and its advice concerning available safeguards against them.

That avoidable errors continue to occur is common knowledge. Unfavorable publicity occasioned by malpractice suits has detracted from the excellent training programs now available to the young surgeon. Dr. Max Thorek, the author of the first four editions, spent a lifetime teaching those privileged to engage in surgical practice to improve their skills, to be aware of the pitfalls and errors of operating and to avoid these studiously.

When the fifth edition was contemplated, specialization toward perfection in many old fields of surgical practice had taken place, with limitation in scope but increase in depth of detail. Many new fields, such as cardiac and vascular surgery, had developed rapidly, requiring new skills and highly technical devices. Successful surgical treatment became available to the very young, the very old and the debilitated patient.

The status of the anesthetist in surgery had become more soundly established, with greater responsibility owing to the use of a larger variety of new agents and methods of administration. The extensive use of whole blood and blood products added another facet to the advancement of surgery. With all these new developments the margin for error had increased, and the need for safeguards was keenly felt.

In keeping with these changes, Dr. Thorek assembled twenty-three contributors, each a specialist in his field, to aid him in continuing this useful volume. It is regrettable that at the time of his death, in his eightieth year, Dr. Thorek had not had the opportunity to see this latest edition in print.

Outstanding chapters to which frequent reference should be made are "Anesthesiology," by D. A. Rovenstine and V. J. Collins, and "Blood Transfusion," by P. B. Szanto and Gertrude Novak. Both chapters, compact and extremely informative, present material, the lack of knowledge of which is more commonly associated with death and disability than are many technical operative procedures.

"Plastic Surgery," by Neal Owens, presents the basic principles of wound treatment and, in addition, covers maxillofacial and cervical deformities, both congenital and acquired, and cosmetic surgery, emphasizing what to do and what not to do in each.

"The Neck," by E. M. Skolnick and D. O. Dale, "The Thyroid," by A. S. Jackson, "The Ear, the Nose and the Pharynx," by F. L. Lederer and F. J. Pollock, together with the section on plastic surgery by Owens, review the surgical aspects of this anatomic segment with a lucid presentation of surgical details necessary to avoid errors and observe safeguards to insure ultimate success.

"The Brain and the Peripheral Nerves," by H. C. Voris, "The Spine and the Spinal Cord," by J. A. Watts and J. H. Mateos, and "Orthopedic Surgery," by E. L. Compere, are replete with information necessary to enable one to avoid errors and provide the specialized care essential to successful therapy.

"Cardiac Surgery," by A. Vineberg, O. Gialloretto, and J. Laberge, presents the surgical, medical and roentgenographic aspects of a variety of cardiac defects and diseases amenable to surgical therapy. The requirements for success in this field are emphasized, and the reader is impressed with their deterrent effect on the unskilled, untrained and poorly equipped surgeon who invades this highly specialized field.

"The Breast," by Max Cutler, details mistakes in diagnosis and the safeguards essential to the avoidance of errors in the surgical therapy of cystic disease, papillomas and carcinoma.

"Errors and Safeguards in General," "The Abdomen in General," "The Stomach," "The Intestines," "The Liver and the Biliary Duct System," and "Hernia," chapters written by Dr. Thorek himself, concern the fields of surgery still left to the general surgeon and reiterate the counsel based on the author's many years of experience in these fields. These chapters are as valuable today as they have been in the past.

"The Pancreas and the Spleen" is an authoritative presentation by Alexander Brunschwig of the management of acute trauma to the pancreas, acute hemorrhagic pancreatitis, chronic relapsing pancreatitis and carcinoma, with advice concerning biopsies and hazards to be avoided. There is a discussion also of trauma to the spleen and of technical details involved in removal of the enlarged spleen.

"The Pleural Cavity, the Mediastinum and the Lungs," by S. A. Mackler, and "The Esophagus," by Philip Thorek, cover the more common conditions encountered in thoracic surgical practice. Well written and illustrated, these chapters present the reader, directly and clearly, with information useful in avoiding errors.

In the chapters "Genito-Urinary Surgery," by H. C. Rolnick, and "Gynecologic Surgery," by A. E. Kanter, the subject matter is presented from a wealth of experience in caring for the most common conditions included in the province of the general surgeon. Here again, the instruction and advice as to the avoidance of errors and complications are invaluable.

Taken altogether, this volume emphasizes the surgical errors and safeguards associated with a wide variety of conditions encountered by the general surgeon and the specialist. It is a valuable addition to the surgeon's library, serving as a constant reminder of the pitfalls in surgical practice.

The chapters covering the highly specialized surgical fields present what the general surgeon should expect. The surgeon lacking in knowledge, talent and skill would do well to consider his competence in the performance of any surgical procedure.

MANUEL E. LICHTENSTEIN, M.D.

Orthopaedia. By Nicolas Andry, Philadelphia: The J. B. Lippincott Company, 1961.

This replica of the first edition of *L'Orthopaedia,* by Nicolas Andry, who has been called the Father of Orthopedic Surgery, consists of two pocket-sized photo-offset-printed volumes. Except for the reduction in size, it is therefore an exact reproduction of the first English edition which was published in London in 1743. The new production was sponsored by the Association of Bone and Joint Surgeons. The publishers give much credit for help received from Dr. Beckett Howorth, orthopedic surgeon of Stanford, Connecticut; Dr. Charles W. Goff, orthopedic surgeon of Hartford, Connecticut; Mr. Frederick G. Kilgour, Librarian, Yale University Medical Library, who made the Library's copy of *L'Orthopaedia* available for reproduction, and Dr. Anthony F. DePalma for the excellent Introduction, which includes an interesting biographical sketch of Andry.

Volume I is divided into what the author calls "three books." In Book I he describes the external parts of the body. Book II is concerned with a description recommended by the author for the prevention of deformities and the correction of deformities in infants and children. Book III describes many different types of deformities not only of the arms, hands, legs and feet but of the skin of the hands, (warts, calluses, chilblains, etc.)

Volume II contains the author's Book IV, which describes many deformities of the head, face, nose, ears and teeth. Defects of speech and loss of the voice are also discussed. Toward the end of this volume there is a thesis in which the author defends his theories and principles of practice before the College of Physicians, and the final chapter is entitled "A Supplement to the Orthopaedia."

Any orthopedic surgeon interested in the history of this great surgical specialty will wish to possess these two beautifully printed small volumes. They should be treasured, by those who buy them, as on a shelf of any home or office library.

EDWARD L. COMPERE, M.D.

Clinical Neurosurgery, Volume 7: Proceedings of the Congress of Neurological Surgeons, Miami Beach, Florida, 1959. Edited by Robert G. Fisher. Baltimore: The Williams and Wilkins Company, 1961. Pp. 278, with 114 illustrations.

This is the seventh volume of the edited proceedings of the Congress of Neurological Surgeons. At this meeting the guest of honor was Dr. William J. German, who contributed three of the fifteen chapters. Two of these have to do follow-up studies, one of gliomas and another of acoustic neuromas, and the third deals with general aspects of the diagnosis and treatment of intracranical tumors. Liberal historical references are presented.

The remaining twelve chapters, by thirteen authors, all deal with various aspects of intracranial tumors. The studies of Harry R. Leventhal on electron microscopic study of brain tumors, of C. M. Pomerat and David Goldblatt on glioblastoma cultures transferred from the guinea pig eye to cell cultures and of Harry M. Zimmerman on the nature of experimental gliomas have great theoretical interest.

From the practical standpoint, chapters on the diagnosis and surgical treatment of various types of intracranial tumor offer the young neurosurgeon much in the way of sound advice and important technical suggestions. A collection of individual presentations such as this lacks the organization and completeness of a planned monograph, but it gives the reader a great deal in spontaneity and detail of individual opinion.

The editors are to be congratulated for having maintained the high standard set by the earlier volumes of this series.

HAROLD C. VORIS, M.D.

The Chemistry of Brain Metabolism in Health and Disease. By J. H. Quastel and David M. J. Quastel. Springfield, Illinois: Charles C Thomas, publisher, 1961. Pp. 169, with 30 tables and illustrations.

The success of any treatise on the specialized biochemical nature of a tissue depends upon the extent to which the author has succeeded in relating biochemical phenomena to the functional characteristics of the tissue. Although the pathways of intermediary metabolism within the brain are similar to other tissues in most respects, the Quastels have adequately dealt with the differences which have particular significance in the understanding of neural function. They have avoided a comprehensive survey of such topics as carbohydrate, amino acid and lipid metabolism and have sought to emphasize only the important facets, particularly as they are related to cerebral dysfunction. A considerable portion of the book is devoted to a discussion of the numerous neurologic disorders associated with distinct metabolic disturbances. One chapter is devoted to a discussion of the various biogenic amines, such as acetylcholine and nor-epinephrine, particularly in connection with their possible role as chemical transmitters and their significance in relation to new psychopharmacologic and psychotherapeutic agents.

Despite the limitations of space, the authors have succeeded in presenting a readable, useful monograph for anyone desiring an introduction to the many neurologic disorders associated with neurochemical disturbances. A comprehensive bibliography would be valuable to anyone interested in the field of neurochemistry.

L. G. ABOOD, M.D.

Diseases of the Intervertebral Disc and Its Surrounding Tissues, by Reuben Rabinovitch. Springfield, Ill.: Charles C Thomas, publisher, 1961. Pp. 137, with 79 illustrations.

The title of this book is somewhat misleading, as it deals primarily with experimental work done on monkeys and gross and microscopic studies of operative and postmortem studies of the intervertebral disc and the surrounding tissues.

Twenty-nine human spines were studied, and 6 monkeys were used as experimental animals. The author concluded that a disease process of unknown cause first alters the disc and that symptom-producing traumas are secondary to such alterations.

Although this is a well-known clinical observation, true in a goodly percentage of cases, the author fails to substantiate the fact in the text.

The material is presented in detail, and three colored photographs attest to the excellence of his procedure. Those interested in this technical detail will find this portion of the book well worth careful reading. The anatomic specimens are excellent and the photomicrographs highly illuminating.

The author reemphasizes the danger of spinal puncture as a cause of herniated discs, especially in children and young adults.

CARLO SCUDERI, M.D.

Clinical Gastroenterology. By F. Avery-Jones and J. W. P. Gummer. Springfield, Ill.: Charles C Thomas, publisher, 1960. Pp. 652.

This book, which emphasis the diagnosis and management of gastrointestinal diseases, reflects the well-integrated medical and surgical approach to gastroenterology as practiced at the Central Middlesex Hospital, London. The authors present, in a most readable form, a valuable and thorough analysis of the field, with the exception of disease of the liver and biliary tract. In respect to this omission, they hope that their book may be regarded as a companion to Professor Sherlock's *Diseases of the Liver and Biliary System.* This is a laudable sentiment, for the two volumes should complement each other superbly and eliminate the redundancy which is, unfortunately, prevalent in textbooks today.

The chapters entitled "Intestinal Motility and its Disorders," "Peptic Ulcer" and "Crohn's Disease" are especially well done. There are separate chapters dealing with symptoms related to disorders of the alimentary tract and with diagnostic techniques—indications, performance, and interpretation—that should prove highly useful. References and index are quite adequate. The paper and the quality of the printing are excellent.

For the clinician interested in gastrointestinal diseases, this book will be a most rewarding investment.

RICHARD W. REILLY, M.D.

Chemistry of Digestive Diseases. By John R. Gamble and Dwight L. Wilbur. Springfield, Ill.: Charles C Thomas, publisher, 1961. Pp. 120.

In this monograph of the Living Chemistry Series an attempt is made to review the literature up to 1959 on basic gastroenterologic research, to provide a comprehensive picture for the clinician. Diseases of the liver and pancreas are excluded, as they are the subjects of other monographs of the series.

The result is a concise, fairly lucid presentation that can easily be read in an evening. The authors have succeeded admirably in extracting from the massive literature most of the highlights supplied by recent advances. An extensive bibliography is also provided. Established facts are clearly differentiated from those still controversial.

Although the monograph is directed to the clinician, it should also prove useful to the developing researcher who seeks interesting problems to solve. As usual, the format and type facilitate easy reading.

PETER MLYNARYK, M.D.

Abstracts from Current Literature

A Discussion of Renal Tumor: Report of a Five-Year Cure Following Removal of Bilateral Pulmonary Metastases. Potampa, P. B., J. Urol. 85:488, 1961.

This paper presents 5 cases of extensive carcinoma of the kidney. Its purpose is to indicate that an attitude of hopelessness of defeat should be shunned by the urologist, since one cannot predict which host or which tumor will respond to simple measures. In 2 of the 5 cases, however, the follow-up period was too brief to have significant value. The fifth case was that of a 62-year-old patient with a tumor of the kidney, which at operation was noted to infiltrate the perirenal fat, and tumor tissue was seen extruding from the tied renal vein. Several months later a nodule was detected in the right side of the chest, and this was removed by lobectomy. Seven months later a left upper lobectomy was done for two distinct tumor nodules. Microscopic study of the tissue removed showed that it was similar to that of the opposite lung and kidneys. A five-year follow-up, including a thoracic roentgenogram, revealed no evidence of tumor. On the patient's last admission, interestingly, it was observed that a radical perineal prostatectomy had been done for carcinoma of the prostate.

The author speculates as to the factors which make possible the survival of this type of patient. He states that it is obviously not due to removal of the tumor. What other factor is in effect is unknown. He mentions other cases in which there is evidence of spontaneous disappearance of a solitary metastatic pulmonary lesion after the renal tumor itself had been removed by simple nephrectomy. He expresses the opinion that the answer is to be found in the biologic make-up of the individual patient.

CARL K. PEARLMAN, M.D.

Ou En Est Le Traitement Chirurgical du Cancer Primitif du Poumon? (Where Do We Stand Today in the Surgical Treatment of Early Lung Cancer?). Latreille, R., and Latarjet, M., Lyon Chir. 56:656, 1960.

After twenty-five years of operations for pulmonary carcinoma the authors try to reappraise the present status of this treatment by comparison of French, Swedish and American statistics, rearranging and subdividing these statistics to answer inquiries in nine various areas.

Some of the conclusions reached are as follows: 1. Only 60 per cent of pulmonary carcinomas diagnosed in the Surgical Service are explored by thoractomy. 2. In only 70 per cent of the cases does exploration lead to resection. 3. Only 25 per cent of the patients who undergo resection obtain a five-year cure. Thus, only about 10 per cent of diagnosed pulmonary carcinomas go on to a five-year cure, which is indeed a poor percentage. Nevertheless, considering that this mortal disease does not respond to other forms of therapy, including irradiation, these figures will have to be accepted as representing the only effective therapeutic agent at present available.

It remains to appraise judiciously the importance of the respiratory deficit that accompanies the cure of the pulmonary carcinoma, as well as the results of respiratory insufficiency associated with cardiac insufficiency. These conditions are necessarily of frequent occurrence. The social rehabilitation of the patient is also discussed. In view of these complications, the current trend toward conserving a maximum amount of pulmonary tissue, or even the consideration of lobectomy with sleeve resection of the main bronchus, must be recognized as significant and, of course, to be appraised in contrast to the other trend, i.e., toward extensive palliative resection.

Considering the site and the histologic picture, the best results have been obtained with epidermoid carcinoma, is present in the majority of the cases in which five-year cures are obtained, and with tumors of the periphery of the lung, which have a better prognosis than have those in the hilar or central region. The operative mortality rate is in direct proportion to the extent of the operation. It is below 5 per cent after lobectomy alone; with an increase in the extent of operation it will exceed ten per cent.

ERNST STERNFELD, M.D.

Median-Nerve Palsy as a Complication of Acute Pyogenic Infections of the Hand. Oates, G. D., Brit. M. J. 1:1618, 1960.

Three cases of carpal tunnel syndrome (median-nerve palsy) resulting from pyogenic infection of the hand are presented. The authors recommend that patients with infections of the hand, particularly those affecting the tendon sheaths, be followed up very carefully for signs of impairment of the median nerve. Patients with symptoms indicating acroparaesthesias should undergo surgical division of the transverse carpal ligament and drainage of the infectious exudate.

CHARLES A. ROCKWOOD JR., M.D.

Studies on the Formation, Flow and Outflow of Aqueous Humor. Berggren, L., Acta soc. med. Upsalrensic 65:1, 1960.

A summary of previously reported investigations concerning the aqueous humor is presented. The formation of aqueous humor, its rate of flow in the anterior parts of the eye and its outflow through a resistant barrier are discussed.

The thesis that aqueous is secreted from the ciliary epithelium is supported in data obtained by measuring the potentials step by step across the different barriers formed by the ciliary epithelial layers.

The technical difficulties encountered in measuring the intracellular potential recordings from the ciliary processes of the rabbit eye, both *in vivo* and *in vitro*, are presented in detail.

The rate of flow of aqueous may be determined by giving an intravenous injection of fluorescein and measuring the time interval before a "green cloud" appears in the pupil (appearance time). Such a measurement rests on certain assumptions, enumerated by the author.

For a more thorough study of the course of events leading to the appearance of a green cloud in the pupil after intravenous injection of fluorescein, it is desirable to follow simultaneously the processes in the posterior and anterior chambers. A technic for this is given. There has been some controversy as to the main site of resistance to outflow of aqueous, but a vast majority of evidence, both clinical and experimental, indicates that the trabecular meshwork furnishes the principal resistance. The results of perfusion experiments supporting this belief are offered.

A perfusion technic is described by which the author demonstrated a "coating substance" in the trabecular meshwork of the eye, and a decrease in this substance after perfusion experiments with various kinds of hyaluronidase.

By means of a new technic of printing on plaster slides, metachromasia, as well as its distribution in the anterior chamber of the tawny owl (Strix aluco), is demonstrated.

Although in the ontogenetic and phylogenetic development of the eye the trabecular meshwork passes from a structure consisting of epitheloid cells into one that is rich in connective tissue, endothelial cells are still abundant in the human trabecular meshwork. A histochemical study of the anterior segment of the eye in the goldfish, the chicken, the rabbit and man, with special regard to the angle of the anterior chamber, demonstrated a similarity in functions between the corneal endothelial cells and those covering the trabeculae. This functional kinship verifies the anatomic observation of endothelial cells extending from the cornea to the trabecular meshwork.

Autologous transplants of tissue from the

chamber angle were made into the anterior chamber in albino rabbits. Observations were then made with regard to vascularization of the transplants and the presence of acid mucopolysaccarides.

This summary of 7 of Dr. Berggren's previously published papers will interest the research-minded, in that it concisely reviews some of his earlier work.

ROBERT F. AZAR, M.D.

Gastric Vagotomy vs. Total Abdominal Vagotomy. Griffith, C., A. Arch. Surg. 81:121-781, 1960.

The author, after performing careful dissection in both the autopsy and the operating rooms, has amply demonstrated that transection of the hepatic vagal branch and of the celiac vagal branches should be avoided at all costs if one wishes to prevent undesirable symptoms, such as diarrhea, vague abdominal discomfort, bloating, gastric stasis, persistent gastric dysfunction and the difficult dumping syndrome. Hollander tests and roentgen studies of the gastric remnant showing positive results verify this. The series of cases presented and their follow-ups, which, the author states, are too brief to permit final conclusions, indicate that there will be no recurrence of any of the undesirable complications aforementioned. In my opinion, therefore, gastric vagotomy is a more logical procedure than total abdominal vagotomy. "Gastric branches from the vagal trunks and gastric nerves carry the entire vagal supply to the acid area" (Jackson, 1948; Griffith and Harkins, 1957). The article is very well written and is substantiated by sound anatomic dissection, and the method presented is worth trying on the patient with a duodenal ulcer. Such a patient may need to be returned to work and rehabilitated in a short time, and may not be able to afford the more devastating effects of a subtotal gastric resection, which is often followed by persistent secondary anemia that prolongs rehabilitation. The selective vagotomy described by the author eliminates one complication—prolonged gastric stasis—that all too often follows total abdominal vagotomy. The hemigastrectomy is performed in the area of the left gastric artery, which is carefully devascularized so that the hepatic and celiac vagal branches may be avoided. The stomach is transected just distal to this area, the surgeon carefully avoiding ligation of the left gastric artery itself, while ligating the esophageal (ascending) and the descending branches. The transection then is continued downward to the region of anastomosis of the right and left gastroepiploic vessels. This is a considerably lower level than the one generally reached in usual subtotal procedures. The hemigastrectomy, in conjunction with the gastric vagotomy utilizing the Billroth I technic, seems to have eliminated some of the distressing complications previously referred to. The antrum is removed in what amounts to a 50 per cent resection of the stomach. A Billroth II procedure may afford a simple solution to the problem of correcting a tightly adhesive duodenum.

D. C. PETERS, M.D.

The Effect of Thiocolchicoside in Spasmodic Conditions of Encephalopathies (L'effect du thiocolchicoside sur l'etat spasmodique dans les encephalopathies). Samel, L., Presse Méd. 68:646, 1960.

Congenital encephalopathic conditions are categorized according to symptoms as resulting from spastic conditions, intelligence defects or various combinations of the two. Therapy in all cases is limited and is usually administered for the specific symptoms involved.

Thiocolchicoside, a synthetic derivative of colchicine, was tried in 3 clinical cases of congenital spastic encephal disease, with apparent improvement in all cases. Thiocolchicoside (1.5 to 2 mg.), given intravenously each day, produced some of the following improvements: ". . . ability to sit up without support, walk unassisted and weight bearing on the entire plantan surface, regression of some of the muscular spasms to allow observation of otherwise undetected voluntary movements."

ERNST STERNFELD, M.D.

The Effect of Cortisone on Normal and Fractured Bone in the Rat. Storey, E., Australian & New Zealand J. Surg. 30:36, 1960.

Osseous changes associated with the administration of cortisone have been incompletely investigated, and experimental studies have not shown a consistent pattern of skeletal change. In man, spontaneous fractures have been reported as resulting from the administration of cortisone. Cortisone has produced rarefaction of the bone in rabbits. In birds, osteoporosis develops. Yet administration of cortisone has not affected the bones of either guinea pigs or mice. Even in rats, doses sufficiently high to retard longitudinal growth of bone and inhibit repair of connective tissue do not consistently affect the density of bone. With extremely high doses of cortisone (40 to 50 mg. per kilogram daily), density of metaphyseal bone develops owing to a reduction in the rate of "osteolytic sequences." A study of the effect of cortisone on the rate of fracture repair in the bones of rats was undertaken. Seventy-four rats were studied under controlled conditions as far as diet was concerned. Cortisone acetate was administered by subcutaneous injection at a dose level of 50 mg. per kilogram per day. The tibia was fractured, the intact fibula providing partial support for the leg. The rats were killed at intervals during the experiment. The tibia, femur, skull and mandible were dissected and the fracture sites fixed, decalcified and then imbedded in paraffin wax. Microscopic sections were then made.

The rats treated with cortisone revealed a formation of dense metaphyseal bone, and, during the healing of fractures, dense callus. At endochondral growth sites, there were a delay in maturation of chondrocytes and a decrease in Alcian Blue-staining extracellular mucopolysaccharide. Resorption of cartilage is decreased so that more remains encased by bone in the metaphysis, where trabeculae, in their turn, are not remodeled to form the diaphysis. In contrast to the growth of epiphyseal cartilage, the early growth of callus is not greatly inhibited, but secondary change occurred during remodeling. The results are a dense callus consisting of bone in various stages of maturation, prolonged retention of cartilage and failure of bony union. Thus, in contrast to rabbits, in which increased resorption is associated with osteoporosis, rats revealed development of dense bone, partly as a result of decreased absorption.

CHARLES M. SWINDLER, M.D.

Clinical Manifestations and Cytology of Hypernephromas. Murphy, G. P., and Fishbein, R. H., J. Urol. 1961, 85:483, 1961.

The purpose of this study was to determine whether any correlation exists between the clinical course and the cellular structure, the latter being studied by several staining technics. The cases of 90 patients with hypernephromas were reviewed from records of the Johns Hopkins Hospital and the Baltimore city hospitals. The tumors were separated into two cytologic groups: (1) Clear cell renal adenocarcinomas with either no visible granules, very little cytoplasmic material or only a small sector with stainable cytoplasm, and (2) granular tumors composed entirely or predominantly of cells with coarse to very fine particulate cytoplasm. When the tumors were divided in such a fashion, a relation was discovered between the granularity of the cytoplasm and the duration of the patients' survival. In 66 per cent, granules were observed in the hypernephroma cells. In 78 per cent of these, metastases were known to have been present on admission, and 80 per cent of the patients did not survive longer than two years. In contrast, only 20 per cent of the patients with clear cytoplasm had no metastases at the time of admission, and 43 per cent died within two years. In the authors' opinion, the difference in the short-term survival rate in the two groups was statistically significant.

In the entire group of 90 patients, a five-year survival rate of 17 per cent was obtained. Many of the 90 were given no curative therapy. No difference was observed in the short-term survival of any subgroup treated by a particular therapeutic regimen

versus nephrectomy. Several new facts elicited from these 90 patients were as follows: a majority showed a significant increase in the erythrocyte sedimentation rate. In 23 per cent there was a history of urolithiasis. In a significant number the serum calcium values were higher than 12 mg. per hundred cubic centimeters. Of 20 with elevated serum calcium levels, 12 had obvious bony metastases, usually to the femur, rib or pelvis.

CARL K. PEARLMAN, M.D.

Tumors of the Hand. Stock, G. H., Brit M. J. 1:919, 1960.

Tumors of the hand are not common, and the few papers published on their incidence differ considerably and suggest that selection of the material varies according to the experiences of the particular writer. There are not many well-written descriptions, however, of benign tumors of the hand.

The author presents an analysis of 300 tumors observed consecutively for three and one-fourth years in the Orthopedic Department of a large general hospital in Great Britian. All localized swellings that occurred below the level of the radiocarpal joint except for warts, are included in the author's analysis. Of the 300 tumors, 61 per cent were ganglia of various types and 10 per cent were epidermoid cysts. For the remaining 29 per cent there were no fewer than 27 different diagnoses. Of this 29 per cent, 46 were neoplasms (44 benign and 2 malignant), 1 a secondary chondrosarcoma and 1 a melanoma. The author discusses completely the anatomic and histopathologic character of the ganglia and epidermoid cysts. American authors may be somewhat confused by his use of a slightly different nomenclature; for example, the author describes, at length, the tumor "synovioma." This is the British designation for what in America is called a xanthoma. The author did not encounter "malignant synovioma" in his series. Subsequent to the submission of the paper he did observe 2 cases, and he describes them briefly. Such swellings as mucous cysts of the skin, lipoma, vascular tumor and nerve cell tumor were rather rare, apparently, in the series he describes. He also discusses at some length, 6 benign tumors which in the United States would be designated as endochondromas.

In the author's opinion, most of the tumors which he encountered are best treated by surgical excision with use of a tourniquet and general anesthesia.

CHARLES M. SWINDLER, M.D.

Gastric Radiation—Nonsurgical Treatment for the Surgical Ulcer. Klein, C., and Berman, J.A.M.A. 176:98, 1961.

This is a report of 50 consecutive (but selected) cases of complicated duodenal ulcer treated by gastric irradiation instead of operation. The usual medical methods of treatment were avoided, and at the conclusion of treatment no dietary restriction or medication was allowed. Cases of intractable obstruction or uncontrollable hemorrhage were not included, and an effort was made to restrict irradiation to a group of patients well advanced in age. The period of follow-up ranged from two to eight years.

The indications for irradiation were: (1) hemorrhage, occult or obvious; (2) massive hemorrhage; (3) intractable hemorrhage; (4) penetration; (5) frequent recurrence of symptoms.

The results in 21 cases were excellent (patients completely free of symptoms); in 11, good (patients free of symptoms except for sporadic attacks); in 1, fair, and in 11, a failure. Of the patients in the 11 cases of failure, 6 required and were able to accept gastric resection, and the other 5 were able to avoid surgical treatment. Of the 50 patients, 39 are considered cured and 44 have escaped the necessity of surgical treatment. Morbidity was limited to nausea and vomiting in the occasional cases of radiation sickness. There was no post-therapeutic anemia, loss of weight or dumping syndrome. In 76 per cent of the cases there were no recurrences. The only death was that of a surgically treated patient who succumbed to

peritonitis and renal failure from leakage of the duodenal stump.

EDWIN R. CORE, M.D.

Treatment of Cirrhosis of Liver by Ligation of a Hepatic Duct (De traitement des cirrhosis du foie par ligature d'un canal hepatique). Leger, L., Cachin, M., Detrie, Ph., Guyet, M.P., and Menegaux, J.-C. I., J. de chir. 79:497, 1960.

In a previous communication (not available to this abstractor) the authors apparently discussed experiments with animals that led to compensatory liver hypertrophy after ligation of a hepatic duct. Clinical observations by French, Dutch and American observers of cases of neoplastic obstruction of a single bile duct as well as the compensatory hypertrophy of liver tissue observed in the unobstructed ductal system, encouraged the authors to operate on a number of patients with the idea of promoting compensatory hypertrophy of apparently normal liver tissue. The current paper reviews the experience of a number of surgeons in 10 cases in which this principle was applied to the treatment of clear-cut cirrhosis due to alcoholism.

The cases are reported in detail. Biochemical studies as well as the results of operative and needle biopsy on the liver tissue are reviewed. Technical difficulties and certain postoperative complications encountered in the cases are discussed.

There were 4 cases in which definite long-term improvement occurred. One patient showed histologic improvement, but died before a long-term evaluation could be made, and deaths due to disease or postoperative complications were reported. At this time, the authors cannot formulate clear conclusions for this operation; they believe, however, that there must be some hope that the liver will be capable of regeneration after the operation. Consequently, cases of far-advanced cirrhosis are unsuitable for study. Schalm and Bax operate only for ascitic forms of cirrhosis. The authors have performed this operation when hemorrhagic portal hypertension was a factor. They conclude that, with further appraisal and improvement of the operation, and if regeneration of liver tissue can be obtained, this method may become an interesting means of treating cirrhosis of the liver.

ERNST STERNFELD, M.D.

Healing Process in the Mechanical Denudation of the Corneal Endothelium. Chi, H. H., Teng, C. C., and Katzin, H. M., Am. J. Ophth. 49:693, 1960.

Regeneration of the corneal endothelium after mechanical insult is studied by making flat-preparation histologic examinations or by examining the results of slit lamp biomicroscopic and histologic tests.

The eyes of 82 young chinchilla rabbits were subjected, under sterile conditions, to two types of carefully standardized corneal endothelial injury. The first type of injury was a small one, inflicted with a 27-gauge needle, and the second, larger type of injury was inflicted with a blunt spatula.

The authors verified that mitoses are not observed in the normal endothelium, and that, under normal conditions, amitosis causes regeneration of the normal endothelium. After mechanical denudation of the rabbit, healing corneal endothelium takes place by means of the activation, migration and multiplication of cells.

Eleven illustrations demonstrating this healing process are included in the paper.

ROBERT F. AZAR, M.D.

Supracondylar Fractures of the Humerus in Children. Mitchell, W. J., and Adams, J. P., J.A.M.A., 1961, 7:573, 1961.

This article is an analysis of the end results of supracondylar fractures of the humerus in children. The paper is based on a ten-year follow-up of 83 children with fractures of this type incurred between the ages of 1 and 10 years, who were treated at the District of Columbia General Hospital.

Descriptively speaking, the two commonly accepted types of supracondylar fractures are those of extension, which comprise 99 per cent of the series, and those of flexion, which comprise 1 per cent. All of the frac-

tures were treated by one or two means. In one group the initial treatment consisted of closed reduction. The other group was treated by means of Dunlop's traction. There was a great discrepancy in the results obtained with the group treated by closed reduction and that group by Dunlop's traction. Manipulative reduction and plaster immobilization did not, as a rule, give results as good as those of treatment by Dunlop's traction, especially in cases of complete displacement.

The most important facts to be learned as a result of this study are as follows:

1. The extremely high percentage of loss of changes in the carrying angle, vascular complications and generally unsatisfactory end results in the group of patients treated with closed manipulative reduction indicates that simple immobilization of the elbow in flexion after reduction does not adequately prevent disalignment of the fragments, and consequently there develops varus or gunstock deformity, which is probably the result of an uncorrected medial displacement of the distal fragments or an occasional accelerated growth of the lateral condyle.

2. Although the functional results are not greatly affected, medial or lateral disalignment (tilt) of the fragments does change the carrying angle of the elbow. Most patients, regardless of the method of treatment, showed gradual regression of its initial limitation in flexion-extension and rotation, but changes in the carrying angle persisted permanently.

3. Comparison of the end results achieved by open reduction, closed manipulative treatment, and Dunlop's traction reveals that the smallest percentage of changes in the carrying angle and the highest percentage of excellent cosmetic and functional results were associated with Dunlop's traction.

On the basis of their ten-year follow-up, the authors strongly urge that Dunlop traction be used preferentially for all supracondylar fractures of the humerus with displacement. The simple posterior plaster slab or closed reduction should be reserved for fractures without displacement or those with a slight degree of displacement.

A strong elbow with a full range of motion and a pronounced gunstock deformity can no longer be considered a satisfactory result.

CHARLES M. SWINDLER, M.D.

In studying primitive medicine, it should be borne in mind that all living matter, be it man or microbe, grows and forms colonies. The main social problems that then arise are personal ailments affecting growth and social situations that interfere with the development of the individual. Responses to stimuli are identical. Plants on a window sill bend their leaves to the sun, responding to the stimulus of light and heat; the branches of a mountain pine grow less to windward; mountain cattle by nature consume the grass and salt they need. There is a spontaneous wisdom in nature. By the same token, primitive peoples often had biologically correct habits. Their taboos and rituals were aimed at protecting their food sources, their reproduction, and their social relationships. Aggregations of human beings likewise respond biologically by seeking such things as can help them to avoid disease, pain, and death.

—*Marti-Ibañez*

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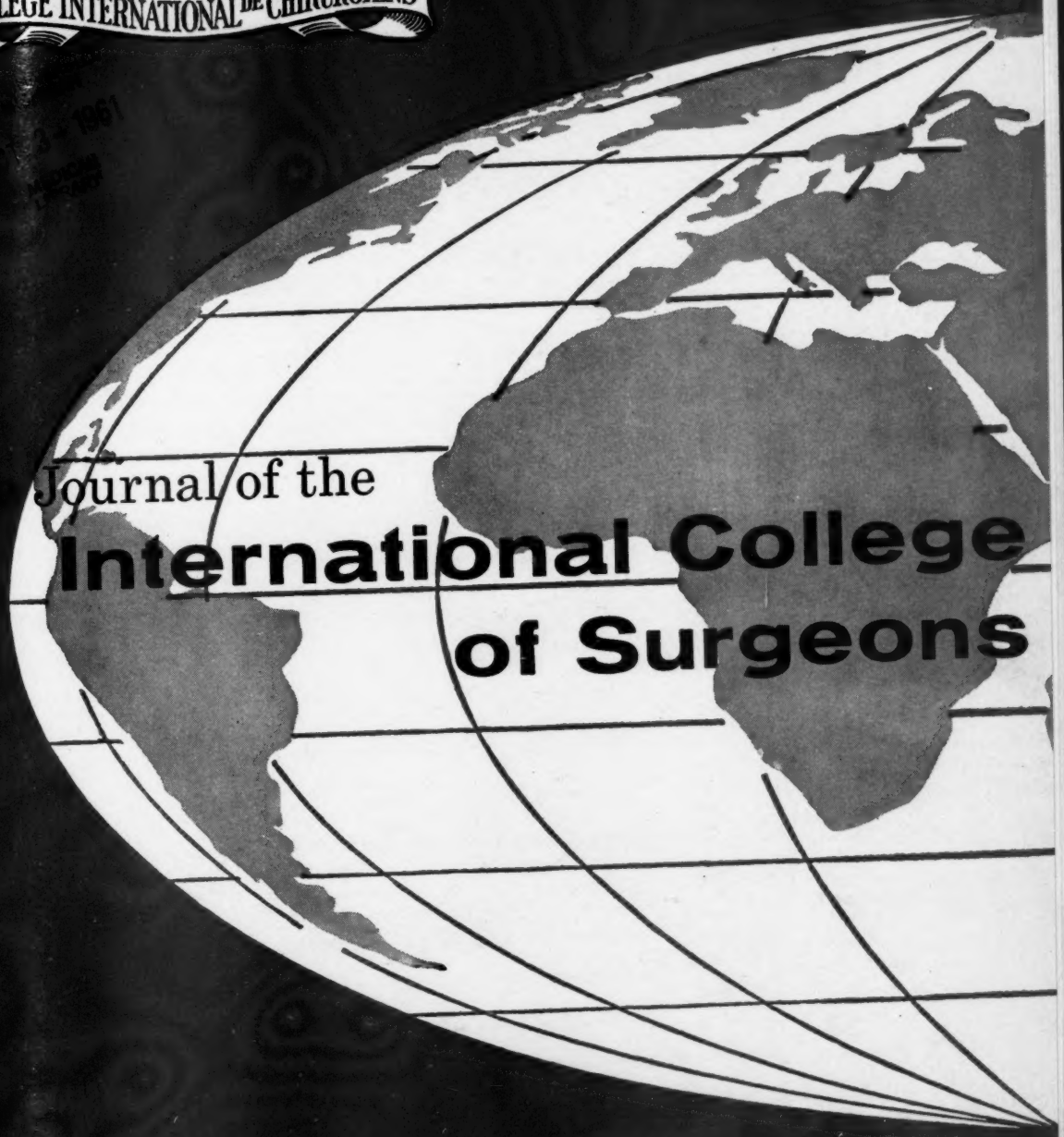
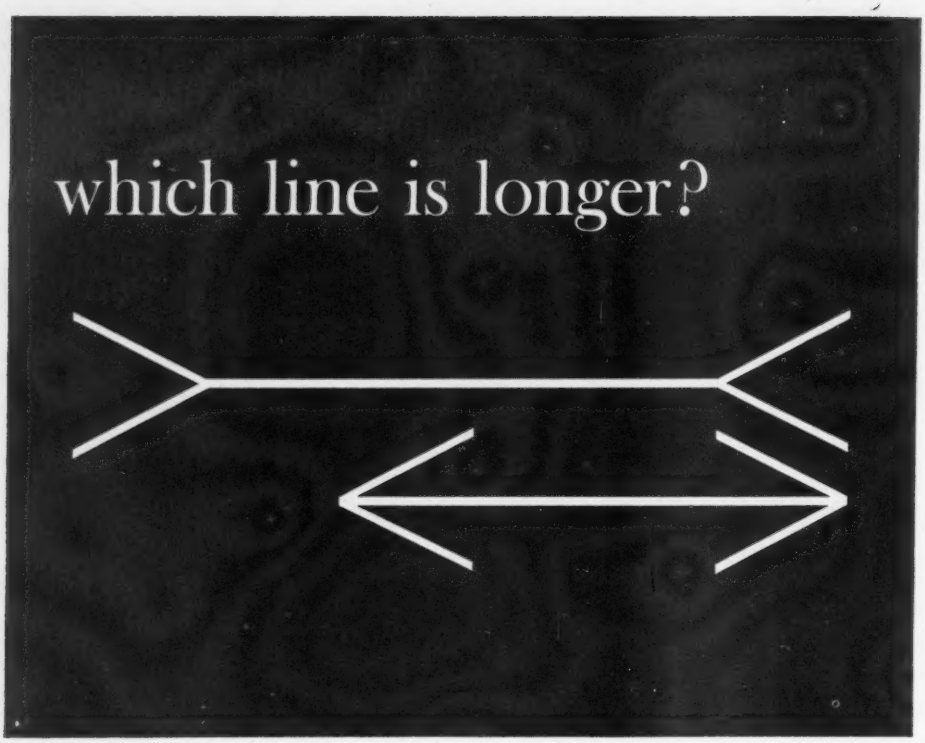


The Journal of the International College of Surgeons

In Two Parts
Section 1
Vol. 36, No. 3

SEPTEMBER, 1961



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